GAS JOURNAL

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STRATEGY AND ECONOMY

THE weighty and authoritative paper presented to the Midland Association on February 16 by Mr. S. K. Hawthorn bids fair to provide material for discussions which will go on for some time, discussions worthily opened by the contributions made at the meeting itself. The paper was published in last week's *Journal*, and our report of the discussion appears on later pages of our issue today. As Mr. Finlayson put it, there are two entirely different aspects from which these considerations may be viewed—the strategic and the economic. A policy might be economically advantageous but strategically unsound, it might be good strategy but poor economics, it might be one of these at one time and the reverse might be true under different conditions. There is another pair of aspects to be borne in mind—those referred to by Mr. Hawthorn in his introduction—the short term policy to cope with the legacy of inevitable neglect in the war years, aggravated by the 'not uncommon policy of wait-and-see' which in too many instances preceded nationalisation, and the long term policy for planning to meet expanding demands and to fix the pattern of development when the area boards get into their stride. In the short term it may be excusable to run as base load plant processes involving the use of imported oil, but can it be seriously contested that in the long run base load plant must be that which secures the very maximum of coal economy?

The case of the small works relatively remote from the nearest larger station is very different from that of the works, large and small, within or adjacent to such a large conurbation as Greater Birmingham. The cost of interconnection of such isolated stations may outweigh that of making them self-contained. And it is not in thermal efficiency that the medium works, at any rate, is inferior to the largest. It is rather in the facilities for technical control that the lesser stations will benefit from their association with the area organisation. If the condition of their plant is unsatisfactory, a policy of renovation may be the best proposition. In some cases the addition of a carburetted water gas plant, where it is not yet installed, would be justified to make them self-supporting in the matter of the peak load.

The bulk of Mr. Hawthorn's paper dealt, however, with the very large works. We are rather surprised that he did not seem to consider such a works in relation to its neighbours. We missed a reference to the very interesting and important development in Liverpool which was described some months ago. Here there are four works spread over the district. Three of these are worked as base load plant, working constantly at their most efficient capacity, while the fluctuations of load are taken up in the fourth. In other words we have here not base load plant but base load stations. And here we may perhaps take a leaf out of the book of our electrical friends. In that industry the long term policy is to build stations in two or more categories according to whether they are to remain continuously in operation or to be brought more or less frequently in and out of operation to meet with long or short periods of peak demand. On the base load stations every refinement of technical equipment is lavished to secure the maximum of thermal efficiency. On the others capital cost is saved by dispensing with some of the more expensive refinements. The parallel policy in our own industry would be to equip the base load works with coal gas plant with every device to secure the maximum thermal return of saleable gas and high quality coke, while the balancing works, still of quite large capacity, would be equipped with, in the first line, coal gas plant to act as standby plant to the whole group, some similar plant to deal with seasonal fluctuations and a large battery of highly developed water gas plant to meet peak loads, to deal with excess coke, and otherwise to serve as a tactical instrument.

To revert to the paper, we cannot agree with the view that increase in throughput, at any rate in vertical retorts, fundamentally increases the output. It is obvious, of course, that if the calorific value of the gas made is constant increase of throughput will mean increase of output per retort, but it will not necessarily mean increase of thermal yield per ton of coal. Can we afford to neglect this? Mr. Wakeford called attention to the seriously increased demand for coal involved in the anticipated expansion of gas consumption in the Birmingham district alone. Again, the calorific value of the gas made can be varied to increase both yield per ton and output per unit of plant. Is it certain that the best combined results in continuous verticals are obtained at 500 B.Th.U.? Ex-

perience shows that the value for optimum results (*i.e.*, minimum overall cost per therm) varies very widely with the class of coal available. It is probable that 500 is the optimum value for Durham coals, it is certainly somewhat lower for Yorkshire coals, lower still for the typical Midland gas coal, and lower yet again for some of the more plentiful of the Scottish coals.

The gas-making process can be varied to give different proportions of gas and coke to the consumer. The most economical all-round ratio, from the consumer's point of view, has yet to be determined. Probably it is not constant. But one thing is certain. The gas industry must base its grand strategy, its long term policy, on producing the maximum number of useful therms—therms, that is, *after* allowing for efficiency in use—whether in gas or coke, which can be delivered to the consumer per ton of coal used in the process as a whole.

PEAK LOAD

MR. HAWTHORN'S treatment of the question of the peak load and his very illustrative diagrams will long be discussed. His estimates of costs will need to be re-calculated in most of the other districts and areas to suit the different price levels which may be prevalent there. Some of his assumptions were questioned in the discussion. Mr. Briggs, for instance, dealt with the reasons why carburetted water gas must be peak load rather than base load plant. One of the main postulates of the gas industry must be the supply of a clean fuel of constant composition, though, as another speaker suggested, appliances can generally tolerate a limited variation both of composition and of pressure. He referred to the use of big coke in the water gas plant and one wondered what had become of the Fuel Research Station's experiments with small (very small) coke in the generator. The possibilities of use of crude or heavy oils in the carburetted water gas plant attracted some speakers, but Mr. Hawes hinted that there were difficulties. Recent work in the United States of America suggests that the difficulties are not yet surmounted. Mr. Dyde was probably 'trailing his coat' when he suggested that it was most economical to make a rich gas in continuous verticals and dilute it with a diluent produced in external plant. At any rate such a policy would be indeed to put the clock back. The whole point, as he said, was to know where the optimum limit of steaming lay—but within known limits blue water gas is made in the vertical retort for a fraction of the coke consumption of external plant and without reduction in thermal output per unit of plant. His remarks on the types of plant for isolated small works were interesting, based as they were on his experience in the Eastern Area. Complete gasification plants are very attractive but they seem to require so far a carefully selected coal. We have not heard the last, either, of the small intermittent vertical, particularly if the objectionable feature of the discharge of incandescent coke could be removed. Smoke and steam nuisance from the gasworks is even more noticeable in the little town than in the big city where the works is often situated in an industrial area not free from other comparable emissions. Mr. Newton spoke with authority on the time required for major repairs to carbonising plant. It is possible that we shall return to labour and material conditions in which it was possible to carry out the resetting of a bed of retorts within the summer months, but there is much to be said for a consideration of the problem at the national level in order that the necessary skilled, and specialised, workers could be maintained in continuous employment. In so large a district as Greater Birmingham that should be practicable.

We have touched on no more than a fraction of the interesting and important problems with which this paper deals. It will no doubt be most carefully studied by executives of all grades. The paper and the discussion it evoked reached the very highest level of responsibility and technical statesmanship.

CONTRACTING FOR THE GAS INDUSTRY

WHAT is a contractor? Why use one? How does the contract system work? Three questions to which every gas engineer, particularly if he is a distribution man, should know the answer. We wonder how many really know how contractors came into being, and how their very hazardous and complicated business is carried on. It appears likely that they are in some degree taken for granted, or are not credited with human qualities. There is, indeed, something impersonal about the large-scale contractors, something that rather smacks of the mechanical man. Such an impression is, of course, superficial; fundamentally, the contractor is not only human but his whole business leans heavily upon the personal element.

For some reason the subject of contracting is imperfectly understood by the gas industry, which has made little enough effort to improve acquaintanceship. We can remember no paper having been given to any gas association on the whys and wherefores of contracting, or any effort on the part of the gas industry to promote a closer understanding of the contractor's problems, with a resultant improvement in relations. It is, therefore, greatly to the credit of the Midland Junior Gas Association that on February 14 two representatives of William Press and Son, Ltd., were asked to describe the 'other fellow's' point of view. 'Contracting for the Gas Industry' was an exceptional paper, and its joint authors, Messrs. W. H. G. Roach and R. Y. Stevens are to be congratulated on tackling this wide subject in a forthright and practical fashion. We can also testify to the excellence of Mr. Roach's presentation, a blend of bluff humour and down to earth logic which is all too rare in these days of the 'academic' speaker who clings anxiously to his script.

Commencing with a history of contracting and a definition of the modern conception of the term, the authors settled down to a painstaking account of the procedure to be adopted when putting a job out to tender. It is here that the aim of the paper is clarified. It is designed solely as a guide to the engineer on the process of contracting, the distribution of responsibility, the legal aspect and the financial arrangement involved in such a transaction. Moreover, it emphasises the contractor's own problems, his heavy overheads, his labour difficulties, and the necessity for him to obtain a balance of work which will best utilise his men and his plant on a long term basis.

As the President of the Midland Juniors rightly sug-

gested, time was when contractors were regarded as complete sharks. If that was ever true, it certainly is not so today. A moment's thought about the nature of contracting is sufficient to reveal the risks entailed. A very considerable office staff is necessary, for estimating time, labour, and materials is a skilled business, and this process must be performed for every job quoted for, whether or not the tender is finally accepted. Again, the amount of mechanical plant involved, although varying greatly among different types of contractor, is highly expensive both to purchase and to maintain, and its acquisition presupposes sufficient employment to justify the expenditure—a matter on which even the best laid plans can come unstuck. Greatest of all, the problem of labour is a constant anxiety. Men are no longer willing to travel distances to work or to stay away from their homes. Indeed, the industry is an unpopular one due to its essentially casual nature, although this has to some extent been rectified by the introduction of welfare schemes and the determination of the contractors to keep their teams together. Moreover, there is the advantage that this partial uncertainty concerning the future functions as a stimulus and incentive; it seems reasonable to suppose that output per man is greater with a contracting firm than with direct labour employed by an undertaking.

It is not our aim to encourage sympathy for the contractor; such an emotion is wasted at the present time of activity in the industry when, broadly speaking, there is ample work for all. It is, however, our belief that a closer understanding of the contractors mode of business must result in a smoother relationship with the client and the avoidance of difficulties which have, due to ignorance, sometimes impaired the amicable partnership which should result from such an alliance.

The authors summed up their description of the contracting industry by pointing out that it is one of the few which possess no cartels or trade agreements, and the spirit of competition in its truest form still obtains; it is one of the last, they suggest, that any government would find it possible to nationalise. The gas industry owes much to its friends, the contractors, and *vice versa*. A paper such as that by Messrs. Roach and Stevens serves to cement the friendship and ensure that future relationships will be on an ever rising plane of mutual understanding and profit.

COMPETITION ABROAD

IT is interesting to turn for a moment to the element of competition between gas and electricity in Australia and the United States of America. We have read with more than passing interest an 'award' paper given at the 1949 conference of the Australian Gas Institute in which it is stated that, compared with the rapid growth of the electrical industry throughout the Commonwealth, and even in those centres where gas supplies were well established, it appears that the gas industry lacks initiative. In New South Wales no new gasworks have been erected since 1914. Outside the metropolitan area the first extension of any note was a high pressure supply to Wodonga in 1947. Within the metropolitan area extensions cannot be classified as pioneering ventures. According to the 'award' paper, in several centres throughout Australia undertakings had been allowed to deteriorate to such an extent that only a restricted gas supply was being maintained to a limited number of consumers. World War 2 did stir the gas industry, and since 1940 the sales of gas from most works in Australia have doubled. But the industry appears to be a 'heterogeneous collection of undertakings lacking uniformity in policy, administration, tariffs and technological methods.' Again, the industry 'seems to resent the growth of electricity, but resentment without unified action will be of no benefit.' The paper is, in fact, a plea for unity and co-ordination of policy and for bolder methods. And the other side of the picture? In Queensland two new power stations have been planned to supply Brisbane; four stations are in course of erection for the Regional Power Boards; in New South Wales the expenditure on generating plant alone at nine stations is estimated to be £35m., and during the next decade a programme of almost equal magnitude has been planned. Behind all this is the fact that in all States of the Commonwealth the development of electricity is directed by a Commission or a Control Authority, and it is anticipated that within a few years any price advantage of gas over electricity will be eliminated. The paper, it should be emphasised, is not the essence of anguish or despair but is a call to the gas industry to approach its problems on a unified and co-ordinated basis with a better psychological approach and with greater confidence in the service which it could and should offer.

From the general we turn to a specific instance of competition—this in U.S.A., concerning the commercial cooking load. The article we have been reading appeared in *Gas-Age* and was written by Mr. Frank H. Trembly, Sales Manager to the Philadelphia Gas Works Company. The title of the article is 'The Commercial Cooking Load belongs to the Gas Industry,' but its contents somewhat qualify the 'belonging' idea. Even as a typical American 'jerk-up' the article is to our mind a depressant. The author divides the commercial cooking load into two parts —the counter cooking load and the main kitchen, heavy duty cooking load. The former consists of the equipment on the back bars of tens of thousands of restaurants and bar-rooms and drug stores. Drug stores (and many drug stories) are, of course, peculiar to America, but the ideas expressed in the article are applicable to our own cafeterias, public houses, and hotels. The counter load, says Mr. Trembly, is rapidly being endangered through lack of effort on the part of the gas industry—an unpleasant fact no longer to be concealed; very unpleasant. For the year 1948 and the first three months of 1949, the sale of electric counter cooking equipment was nine times that of equivalent gas appliances. 'The loss of the load has been gradual but persistent and has now reached the point where some electric counter cooking appliances receive substantially greater customer interest and a defeatist attitude by some gas companies.' 'We are,' says the author, 'suffering from the operation of a vicious circle in this field, as the lack of customer interest in turn reduces the interest of the manufacturers of gas equipment in improving their appliances.' In regard to the heavy duty cooking field, something adverse is going to happen unless more aggressive action is taken by the gas industry. That is the view of Mr. Trembly, who points out that the all-electric kitchen is not justified on any sound basis of economics or

operating advantage, yet the numerous electric installations seem to indicate that the gas industry has been out-advertised, out-sold, and out-smarted by the electrical industry. And the battle goes to the strong.

PIMLICO PRIVATE ENTERPRISE

FOUR seven-storey blocks of flats for middle class families are being built on behalf of the Duke of Westminster on a two-acre triangular site bounded by Ebury Street, Pimlico Road, and Ebury Square, Pimlico, at a cost of about £400,000. There are to be 109 flats in all, with accommodation for about 412 persons, and it is hoped that the first of the flats will be available for letting by next Christmas. The flats are to be fully serviced for gas. Provision is being made for cooker and copper points in the kitchen, and each flat will be provided with a Fulham grate with an Eagle convector feeding warm air into either the living room or the principal bedroom. A gas fire is being installed in one of the bedrooms, with gas fire points in the other bedrooms. Central domestic hot water will be derived from a coke-fired boiler with a 30 gal. cylinder with calorifier in each flat. From the same circuit there will be a radiator in the kitchen, another in the hall, and a towel rail in the bedroom. The whole scheme includes 27 drying rooms with Ranalah units fitted into cupboards supplied by the owners. The plans provide for 25 one-bedroom, 52 two-bedroom, and 32 three-bedroom flats, all self-contained, and the blocks are so designed that each flat will have three sides to the sun. The living room is at the extreme end of each wing so that noise from neighbours is minimised. An innovation is a small community centre which can be hired by tenants for private parties and receptions.

AMERICAN GAS SALES

LATEST figures for sales of the American gas utility industry, published by the Bureau of Statistics of the American Gas Association, show that in November last there was an increase of 13.3%, compared with sales in the previous November, from 2,748 mill. therms to 3,112 mill. therms. An analysis of this overall increase indicates that sales of natural gas rose by 15.4% to 2,842 mill. therms; the decline in manufactured gas sales continued with a further fall of 2.6% to 186.5 mill. therms; and sales of mixed gas showed a larger decrease of 10.1% to 83.4 mill. therms. During the 12 months ended November 30 quoted statistics reveal a similar relationship to the above figures between the three types of gas. Compared with the corresponding period ended November, 1948, natural gas sales were 10.6% higher at 31,703 mill. therms, while manufactured gas sales fell by 4.4% to 2,258 mill. therms and sales of mixed gas showed a decline of 8.8% to 1,174 mill. therms. The total increase in the 12 months was 8.7% with a sale of 35,135 mill. therms.

Letters to the Editor

RETORT HOUSE INSTRUMENTATION

DEAR SIR,—Your editorial of February 15, commenting on Mr. Ernest West's discussion of retort house instrumentation is not only timely but of considerable interest to gas engineers concerned with the installation of new carbonising plant.

The warning against over-elaboration and, more especially, over-centralisation, may well be taken to heart. However, I have yet to see the retort house where there is 'instrumentation for the sake of instrumentation.' Reputable instrument makers keep well clear of elaborate installations which might be beyond the maintenance provisions the gas undertaking is willing to make. Plans for new retort houses often specify 'centralisation of all readings' when it then becomes the duty of the instrument manufacturers to offer practical alternatives. Most of the new 'super plants' are moving with the times, but this need not mean over complication.

In some cases the instrumentation has not been placed in the hands of one maker and, instead, the gas undertaking has mounted nearly all its instruments, sometimes collected over a long period, in a home-made panel. Badly run connections complete the sad story which will condemn instruments at that works for all time Where the situation demands the centralising in a clean place of certain important recorders and integrators, the practical solution is the employment of simple, robust transmitters installed adjacent to measuring points to eliminate long, obstructable communicating pipes. Leading manufacturers will not guarantee the accuracy of instruments which must work under unpredictable conditions. This applies particularly to the metering of crude gas.

Your editorial rightly asks if such a measurement is sufficiently accurate to give a reliable indication of gas make. Usually the prospective purchase of a crude gas meter insists that only an approximation is required. But one can be sure that the meter will be blamed if readings do not tally within a little of the estimated make.

The past few years have seen much learned about retort house instrumentation. As the writer has said many times before, the increasing number of successful installations is due to closer collaboration between gas engineers, plant makers, and instrument firms, without which real progress could never be made.

Yours faithfully,
L. JAMES.

70, Teignmouth Road, Willesden Green, London, N.W.2.
February 20, 1950.

THE TOTTENHAM DISPUTE

DEAR SIR,—The British Gas Staff Association has been concerned in the dispute at the Tottenham works of the Eastern Gas Board, having represented the interests of its members throughout the enquiry instituted by the board. My Association is satisfied that the enquiry was most fairly conducted by the area board Chairman who has long experience in labour relations.

The industry and its staff relies on the technical Press to present unbiased, complete, and correct reports and it is unfortunate that, even while this matter remains unsettled, you should have published, in your issue of February 22, a report which is not a balanced summary of the proceedings of the tribunal or the decisions of the board.

I am most interested to learn that the opinion is said to be held that the dispute may be connected with the demands made during the Parliamentary proceedings on the Gas Bill for direct participation of employees in the management of the nationalised industry. These demands were, as far as I am aware, put forward by various Members of Parliament at the request of this Association only and without consultation with other trade unions. The B.G.S.A. believes that, to achieve the spirit of partnership so necessary for the running of a nationalised industry, the employees should be directly represented at the highest level (as they were in certain co-partnership undertakings) and that there should also be consultative machinery throughout the industry. Had there been effective machinery in the Eastern area it is probable that the trouble at Tottenham would never have arisen but to suggest that the principle of employee representation is connected with the unofficial strikes of workers there is without foundation.

Although it is conceded that a manager must have the necessary authority and prestige to control and that the proper exercise of that control must not be overridden by unofficial strikes which hold the public to ransom, it is hoped that, in the gas industry, the management will become so enlightened as to realise that the most effective management is by consent and not by the arbitrary exercise of authority.

Yours faithfully,
F. C. HENFREY-SMITH,
General Secretary.

British Gas Staff Association,
203, Knightsbridge, London, S.W.7.
February 24, 1950.

THERMAL RATING OF BURNER INJECTORS

DEAR SIR,—The paper on 'Thermal Rating of Burner Injectors' in your issue of February 15 was very interesting for me as I have recommended the built-in gas pressure governor for 20 years. In Germany, however, I have as yet had no success though I hope it will come some day.

With the calorific value fixed, as I think it is guaranteed by law in England, I cannot see any advantage in observing the Wobbe index. However, as soon as you take

$$\frac{\text{calorific value} \times \text{square root of pressure}}{\text{square root of specific gravity}} = \text{const.}$$

you only need to have a spring loaded pressure governor, which can be adjusted for peculiar cases such as Middlesborough seems to be.

As far as my personal observation goes the remark of Mr. S. Jones that the air entrained remains constant when specific gravity changes is correct in theory only. The moving force is given by the mechanical law of impulse—*i.e.*, mass by velocity. This can be supplanted by: twice the area by pressure. But this law neglects the friction and rotational losses during the impact. Here the viscosity changes the results. It will vary with the specific gravity, which also changes the outlet pressure necessary at the burner ports. In fact, heavier gas entrains rather less air than a lighter one.

Certainly whenever you raise the pressure to counteract a higher specific gravity more air will be entrained, but not to the same amount as when raising the pressure of an unchanged gas. Still I believe that within the limits required the difference in composition of the mixture is of no harm for cooker burners.

Whenever you succeed with a neat gas burner you can be satisfied with a slightly less aerated burner, if it is properly constructed—*i.e.*, flat flames and an appropriate concession in efficiency.

Yours faithfully,
J. KORTING.

Gasinstitut, Karlsruhe.
February 22, 1950.

BENZOLE RECOVERY

DEAR SIR,—Mr. Hawthorn in his recent paper published in the *Gas Journal* of February 22, devotes a small section to benzole extraction from vertical retort gas and concludes it is an unsound policy to wash for benzole. As I do not agree with the author in his conclusions may I make a few brief comments?

(1) At a calorific value of 475 complete use has been made of the sensible heat in the coke available for the water gas reaction and water gas for further dilution down to 450 can only be made by the expenditure of fuel in the producers, coke in the retort, and steam, under conditions less favourable to water gas production than in a water gas plant.

(2) The 16.5% of extra gas is made up of 6.4% benzole and 10.2% water gas. The water gas is not something for nothing as pointed out by the author, but is actually costing more than if produced in a water gas plant. This 10.2% water gas is being carburetted to a calorific value of 450 with benzole which, alternatively, is recoverable and worth 2s. 4d. per gal., whereas on a carburetted water gas plant the carburetting medium is gas oil costing 11d. per gal. It is quite a possibility that the 16.5% extra gas is costing more than its selling price.

A point I would like to put is: If it is a proposition to leave benzole in gas to carburet diluent gases, why not extend the idea and make low quality gas in verticals and carburet the purified gas with petrol?

On a plant having a declared calorific value of 470 it would be possible to increase the thermal output by over 12%; why then are not schemes of this nature adopted if the economic arguments used against benzole recovery are sound.

Finally, other factors in favour of benzole recovery are the reduction in organic sulphur content in the gas and also, at this critical period, it is a dollar saver.

Yours faithfully,
F. FIRTH.

Laboratory,
Meadow Lane Gasworks,
Leeds 11.
February 25, 1950.

INDUSTRIAL RELATIONS

DEAR SIR,—I would like to draw your attention to the following inaccuracies which appeared in an editorial note under the heading of 'Industrial Relations' in the issue of the *Gas Journal* dated February 22.

(1) The correct title of the body referred to in the opening sentence is 'The National Joint Council for Gas Staffs.'

(2) It is incorrect to state, as you do, that 'The machinery has been completed for consultation and negotiation between the employers. . . . and all their employees within the nationalised industry.' While the majority of our employees are covered by machinery already established, it is not, however, the case that this machinery embraces *all* employees within the industry.

Yours faithfully,
ALFRED B. BADGER,
Industrial Relations Officer.

The Gas Council,
Industrial Relations Department,
1, Grosvenor Place, S.W.1.
February 24, 1950.

During 1948 there were, according to the 73rd annual report of H.M. Inspectors of Explosives, 120 accidents in manufacture, resulting in the death of three persons and injuries to 36. The total includes 35 accidents during the manufacture of detonators, resulting in one death and injuries to 17 persons. Of these detonator accidents 16 happened while pressing the composition into detonator shells, but no worker was injured as a result. The Working Party on Ammonium Nitrate has not completed its report, but during the year large-scale trials were carried out with pure ammonium nitrate made in this country. As a result of these trials it has been agreed that for transport in ships, ammonium nitrate, free from organic matter, should be packed only in new steel drums, which may be lined with waxed paper. If it is packed in this manner, says the report, it is practically free from hazard when involved in a fire.

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100 YEARS AGO

Blood and Thunder

There is no reason to doubt that the gas consumers of Southwark and Lambeth are today as orderly and appreciative as any in the country. It was not so a century ago, as a correspondent recorded in the March, 1850, issue of the *Journal*. This gentleman, who signed himself 'Live and Let Live—Not Anti-Humbug, nor "those words reversed",' described how at an uproarious meeting, consumers demanded

Line drawing by G. W. Battison.

a reduction in the price of gas from 6s. per 1,000 cu.ft. to 4s. Missiles were thrown and an arrest made as the crowd roared, 'Those round things called gasometers are for us.' The chairman's sympathies were delicately poised between the black hands and the white. Our correspondent concluded with a rhetorical warning to the old companies to resist these unreasonable demands. 'Experience keeps a dear school,' he wrote, 'and like the stern-lights of a ship, has been said only to illumine the past. Don't navigate in fear; be steady at your posts, and all will yet be well for all parties.'

Personal

Mr. **J. B. Balmforth,** Engineer and Manager of the Bingley undertaking, North Eastern Gas Board, will retire on March 10. A native of Elland, near Halifax, Mr. Balmforth held appointments at Silsden, Bangor, and Swadlincote before going to Bingley 33 years ago.

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Mr. **F. S. Brown,** Showroom Manager at the Peterborough undertaking, has been appointed in the same capacity at Nottingham. Mr. Brown, who started as a junior sales assistant at Coventry, went to Peterborough in 1946. He is a member of the London branch of the Incorporated Sales Managers' Association.

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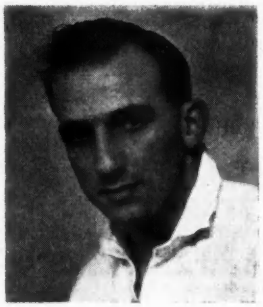
Mr. **B. A. Mallender,** General Manager of the Notts. and Derby Division of the East Midlands Gas Board, has, on medical advice, requested to be relieved of his duties before the normal date of his retirement in September of this year. Mr. **K. L. Pearce,** General Manager of the Leicester and Northants. Division of the Board, has been nominated to succeed Mr. Mallender as General Manager of the Notts. and Derby Division. The date of Mr. Mallender's retirement will depend to some extent on his health and also on how soon Mr. Pearce can be relieved of his duties at Leicester. The Board has expressed its appreciation of the valuable services rendered by Mr. Mallender since his appointment, and its regret that circumstances should have made it necessary for Mr. Mallender to retire before the normal date.



Mr. **Ivor Preece,** captain of the England, Warwickshire, and Coventry Rugby Football XV's, joins the sales staff of George Wilson Gas Meters, Ltd., Coventry, today (March 1). Mr. Preece was also a former Schoolboy International and captained the English Schoolboys XV. He will, in fact, be having leave of absence very shortly after joining the Company, as he will, of course, be touring with the British team in Australia and New Zealand.

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Mr. **C. E. Dickinson,** Manager of the Widnes undertaking, North Western Gas Board, will retire at the end of this month. Mr. Dickinson, who has had 40 years' experience in municipal gas and water engineering, served four years in the City of Leicester Water Department, and the remaining period in the Gas and Water Department of the Widnes Corporation as Engineer and Manager. He is a well-known personality in the municipal and communal life of Widnes, being a founder member of the Widnes Rotary Club and of the Executive Council of the Chamber of Commerce, and a vice-president of Widnes Football Club.

Obituary

WILLIAM DIETERICHS

The death of Mr. William Dieterichs, briefly announced in the *Journal* last week, has removed one of the most widely known officers of the North Thames Gas Board and one who took a notable part in the development of industrial gas utilisation, not only in his own area but nationally through the Industrial Gas Development Committee, in the past half century. He died at St. Bartholomew's Hospital, aged 54, on February 20 after a short illness, and leaves a widow and son. Entering the service of the Gas Light and Coke Company in 1910 he began work as an apprentice, and his first important appointment was as Manager of the Industrial Workshops. The industrial section had been started at Goswell Road in 1915 and Mr. Dieterichs took charge of it shortly before its transfer to Watson House in 1931 as part of a scheme for centralising the research activities of the Company. The sales staff showed that industry needed special gas equipment, and very often Mr. Dieterichs and his staff designed and made prototype apparatus for specific jobs.

The Manager of Watson House at the outbreak of the 1939-45 war was Mr. C. A. Masterman who, following the death of Mr. Stephen Lacey, was seconded for special work in connection with the industry's Planning Report and went to the Ministry of Supply on experimental work before finally resigning from the Company. In 1945 the Directors of the Gas Light and Coke Company formally announced the appointment of Mr. Dieterichs as Manager of Watson House. He was Chairman of the Industrial Gas Development Committee —formerly known as the Industrial Gas Centres Committee— for ten years up to October, 1942, when he was succeeded by Mr. H. R. Hems, of Birmingham. Mr. Hems retired from the Chairmanship in October, 1947, and Mr. Dieterichs again undertook the duties, which he continued to discharge until the time of his death. His position as Manager of Watson House was continued when the North Thames Gas Board took over the Gas Light and Coke Company. He was well liked and his colleagues showed their high regard for him by holding a memorial service at Watson House on February 24.

Mr. C. A. MASTERMAN writes:

May I express for myself and others an extreme sense of our loss at the passing of 'D.' We had known each other for over 20 years, for 10 of which we shared adjacent offices in perfect co-operation. I was a relative newcomer, while he was an old hand, but never could there have been more absolute loyalty than he showed to me. Indeed, 'loyalty' best describes him; loyalty not only to the individual or to the organisation, but loyalty to an idea—the idea of public service and unswerving honesty in industry.

'D' had a genius for co-operation due to his ability to inspire affection from the junior apprentice, whose difficulties he knew so well, and from the tough leader of industry whose technical problem he was so ready to solve. Well as I knew him, I never heard from him an unkind remark about others, nor have I ever heard him claim any credit for himself. But to him immense credit is due, both for technical achievement and for his quiet but inspiring influence towards co-operation in the industry he served so well.

It will not now embarrass him, as of old, if I express my unbounded admiration for him which has been shared so generally. The great sympathy of all of us who knew him will be extended to his family and to his colleagues.

Mr. MICHAEL MILNE-WATSON, Chairman of the North Thames Gas Board, writes:

In William Dieterichs the North Thames Gas Board has lost a master craftsman of native genius. He hated ugliness and what he created was elegant as well as purposeful. With an unequalled flair for design he could not help getting things right; he knew, without calculation, how they should be. His 40 years' service with the Gas Light and Coke Company and the Board were an inspiration, for he started as a gas fitter apprentice in 1910. He served in the first world war, rising to be a Captain in the Royal Engineers, and returned with widened experience. In 1927 he took charge of the Company's industrial gas workshops, then a modest establish-

ment, and in developing them it may fairly be said that he revolutionised industrial gas practice. From pottery kilns to the 5-therm producer for standby gas supplies there was practically no form of industrial appliance on which he did not put the stamp of his personality. He was a great individualist but one of his most happy characteristics was the generosity with which he would give credit to a collaborator. He had a deep affection and loyalty for the Company which remained unshaken in spite of ample opportunities to make a career elsewhere. As a man he was loved by all, and I need say no more than that on the day of his funeral his staff and workpeople themselves arranged for a private service to be held at Watson House where so much of his work was done.

A memorial service for Mr. Dieterichs will be held at 3 p.m. on Friday, March 3, at St. Matthew's Church, Wandsworth Bridge Road, Fulham, S.W.6.

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Mr. **Francis Rook,** Engineer and Manager of the former Rye Gas and Coke Company, now part of the South Eastern Gas Board, has died in hospital at Hastings, aged 74. He was with Samuel Cutter and Sons, Ltd., gas constructional engineers, for over 30 years, and travelled all over Great Britain and extensively on the Continent for the Company as outdoor superintendent. He first went to Rye in 1900, when he supervised the construction of the holder at the Rye works. It was while this was in progress that he married the second daughter of Mr. E. Mann, who was Manager of the Rye undertaking. Mr. Rook took over the works on Mr. Mann's retirement in 1926 (Mr. Mann having completed 50 years' service with the Company). Soon after Mr. Rook took over, electricity came to Rye and gas consumption fell considerably, but during Mr. Rook's 24 years as Engineer and Manager he installed new gas-producing plant, and on his retirement on December 31 gas consumption had increased by 100%.

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Mr. **F. G. Brockway,** who, up to vesting day, was Engineer and Managing Director of the Cleethorpes Gas Company, died at his home at Cleethorpes on February 19. About two years ago he had a sudden illness from which he never completely recovered, and he had a further attack a few days before his death. He was 65 years of age. Born at Norton, Malton, Yorks, and educated at the Grammar School, Clee, of which he later became a Governor, he received his early training at Cleethorpes gasworks and subsequently as a pupil engineer with Robert Dempster and Sons, Ltd., of Elland, on whose behalf he served at gasworks in many parts of the British Isles and abroad. He was appointed Assistant Engineer and Manager at Cleethorpes in 1922, succeeding to full control on the death in 1925 of his father, the late Mr. E. J. Brockway. Mr. Brockway's father was one of the founders of the Eastern Association of Gas Engineers and Managers in 1888 and was President in 1907. Mr. Brockway himself joined the Association in 1925 and was President in 1934, when the annual meeting was held at Cleethorpes.

Diary

Mar. 2.—North Thames Gas Consultative Council, St. Ermins Hotel, Westminster, 2.30 p.m.

Mar. 2.—Midland Junior Gas Association : Afternoon Visit to Ledsam Street Works of Belliss & Morcom, Ltd., Birmingham.

Mar. 7.—Institute of Fuel : 'District Heating in New Towns,' A. E. Margolis. Institution of Mechanical Engineers, Storey's Gate, S.W.1. 5.30 p.m.

Mar. 7-April 1.—Ideal Home Exhibition : Earls Court, Olympia, and Castle Bromwich (Birmingham).

Mar. 8.—Eastern Junior Gas Association : Competition Papers. Ipswich.

Mar. 8.—Scottish Junior Gas Association (Western District) : Afternoon Visit to J. G. Stein & Co., Ltd., Bonnybridge.

Mar. 11.—Scottish Junior Gas Association (Joint Meeting) : Paper by J. H. Dyde, Junior Vice-President of the I.G.E., Deputy Chairman, Eastern Gas Board. Glasgow.

Mar. 14.—Midland Junior Gas Association : 'Construction of Tower Purifiers,' E. Arthur, A.M.I.W. (Birmingham). Birmingham.

1950 'Journal' Directory

The Directory information in the 1950 edition of the *Gas Journal Calendar and Directory* was as complete and accurate as possible up to the time of going to press, but the nationalised structure of the industry is still being completed, and apart from current casualties alterations continue to be notified. We published the first list of revisions in the *Journal* of February 1 (p. 259). The following further changes notified during the past month (together with the appropriate adjustments relating thereto in the 'Personnel' section, pp. 135-148a) should be noted in order to keep the Directory up to date:

Page 21.—NORTH THAMES GAS CONSULTATIVE COUNCIL: T/N BAYswater 3553. *Secretary,* W. Elliott. *Members:* Line 2, insert Councillor W. L. Carr, J.P., Northwood. Line 3, insert Councillor F. Cullen, Romford. Line 4, Mrs. E. A. Hughes should read Mrs. E. H. Hughes; insert Alderman C. W. Jackman, Ealing. Line 6, delete Mrs. J. Phillips, Westbourne Grove, and Councillor H. M. Royle, Southend-on-Sea. Line 8, delete Councillor W. H. Venner, Brentwood; insert Alderman T. H. Wheeler, J.P., Westminster.

" 21.—NORTH WESTERN GAS CONSULTATIVE COUNCIL: Add Alderman W. Burrows, J.P. (St. Helens), Miss A. V. Baynes, F.S.H.M. (Lancaster) and A. Neil Jacob (W. & R. Jacob & Co., Liverpool), *members.*

" 23.—WALES GAS CONSULTATIVE COUNCIL: delete 13, Pembroke Terrace, Cardiff, T/N 4436. Add: Chairman's Office, Bank House, Great Oak Street, Llanidloes. T/N 323. Add: *Secretary,* T. O. Jones, 1-2, Windsor Place, Cardiff, T/N 4330.

" 23.—SOUTHERN GAS CONSULTATIVE COUNCIL: Alderman W. J. W. Broomfield (Lymington). Alderman S. J. Gale (Bridport), *members.*

" 29 and 30.—EAST MIDLANDS: Notts and Derby Division: E. W. Pickering, *Divisional Mains Engineer;* J. R. Whittingham, *Divisional Transport Officer.* Transpose Ilkeston, Kegworth, and Riddings from Nottingham Sub-Division to Derby Sub-Division; and South Normanton and Blackwell from Nottingham Sub-Division to Chesterfield Sub-Division. Burton-on-Trent: C. H. Underhill, *M,* vice H. Wynne.

" 31.—MARKET HARBOROUGH: A. J. Henry, *M.*

" 73.—SOUTH EASTERN GAS BOARD: A. S. Holden, *Deputy Secretary.*

" 74.—WEST SURREY DIVISION: Third line under subheading 'Station Engineers (Works)' should read: H. J. Hodder, Kingston. T/N Kingston 5601.

" 74.—KENT SUBURBAN DIVISION: E. R. Ward, *Station Engineer,* Sydenham, in place of T. W. Gibson.

" 76.—HAWKHURST: C. M. Gibson, *M,* vice J. B. Hyde.

" 78.—UCKFIELD: R. M. Hodge, *E.*

" 105.—LLANDRINDOD WELLS.—C. B. Felton, *E & M,* vice F. W. Croxton.

" 105.—CAERNARVON GROUP.—*Convener,* W. O. Hughes, Holyhead Gas Works, Holyhead. T/N 17.

" 105.—LLANBERIS: delete A. L. Cookson, *E & M.*

" 106.—BEAUMARIS: delete R. Wilkinson, *E & M.*

" 106.—PRESTATYN: O. P. Cronshaw, *E & M,* vice R. O. Roberts.

" 107.—CONNAH'S QUAY: R. O. Roberts, *E & M,* vice J. Brook.

" 107.—BUCKLEY: R. A. Gittins, *E & M,* vice F. E. Hanley.

" 110.—CHEADLE DISTRICT: H. W. Allan, *E & M,* (not Allen).

" 110.—ROWLEY REGIS DISTRICT: W. Rhodes, *E & M,* vice T. Thornton (deceased).

" 113.—SHROPSHIRE DIVISION: Head Office, Sidney House, School Court. T/N Shrewsbury 4015-6.

" 113.—CHURCH STRETTON DISTRICT: Address, c/o Temeside, Ludlow, T/N 66.

" 127.—SKELMORLIE: Delete T. Stewart, *E & M.*

" 126.—KILWINNING: T. Stewart, *E & M.*

" 127.—MAYBOLE: Delete J. Gibson, *E & M.* (deceased).

" 156.—JERSEY GAS LIGHT CO., LTD.: W. Wedgwood, *E.*

News in Brief

The Head Offices of the Leeds Group, North Eastern Gas Board, are now at Sweet Street, Leeds 11. The telephone numbers remain unchanged.

The Wales and Monmouthshire Association of Gas Engineers and Managers will hold its 45th annual meeting at Tenby, South Wales, on May 18 and 19. The first day will be devoted to the usual social functions, and the second day to business. The official luncheon and dinner will be held at the Royal Gate-house Hotel.

Reference was Made at a meeting of the Scarborough Town Council to a request to local authorities by the North Eastern Gas Board to stop renting gas cookers. The council decided as a temporary measure to buy up all the second-hand cookers obtainable in reasonable condition and at a reasonable price to meet immediate needs.

The Second of a Series of instructional talks to fitters of the Mid-Glamorgan Group of the Wales Gas Board was held at Port Talbot on January 25 and 26. The talks were given by Mr. J. C. Thomas, of Main Water Heaters, Ltd., and about 60 fitters attended from the various undertakings in the group. A large proportion of each session was devoted to 'Question Time' and many interesting points were raised. The arrangements for this series of talks are carried out by members of the Port Talbot undertaking, under the direction of Mr. W. F. Edwards, F.C.I.S., General Manager and Secretary.

Mr. W. R. Armstrong, Gas Manager at Coleraine, Northern Ireland, has made a strong complaint to the Borough Council over the inferior quality of coal supplied. The Council has appointed a deputation to interview the Northern Ireland Ministry of Commerce and has authorised it to take any other steps they deem necessary to secure an improvement. Mr. Armstrong said that on a recent occasion the results had been almost disastrous, the stock of gas having been reduced, and pressure became so low that the supply to the borough and Portstewart failed completely. Not only was it a day-to-day anxiety to maintain supplies, but the financial loss to the undertaking was considerable.

Dundee Health Committee has decided to support the Scottish Division of the National Smoke Abatement Society in its appeal for a reduction in the price of smokeless fuel. The committee heard a resolution from the Society deprecating the use of bituminous fuel in grates designed to burn smokeless fuel. Mr. W. M. Smith, Chief Sanitary Inspector, said one of the difficulties in persuading people to use smokeless fuel was its high cost. Coke in Dundee cost 63s. 2d. per ton and 70s. 4d. delivered. There was no doubt that the present low-level smoke from pre-fabricated houses burning bituminous fuel was a nuisance. Mr. Charles Buick said they could hardly recommend tenants to use fuel which might be beyond their financial reach after paying fairly heavy rents.

One of the Strongest savings groups in Audenshaw, Lancashire, is that of General Gas Appliances, Ltd. Over the last six months 370 members have subscribed £4,011.

The Society of British Gas Industries Golf Circle will hold its spring meeting on June 5 on the Parkstone Golf Course, Bournemouth. Members of the Circle will compete for the Thornton Cup, and members of the Institution of Gas Engineers will compete for the Coronation Plate. Mr. W. Morland Fox, Hon. Secretary of the Circle, announces that entry forms and full details of the meeting will be issued in due course.

Halifax Corporation Finance Committee has decided to recommend a rate of 21s., an increase of 1s. in the £. Alderman John Radcliffe, Chairman, attributed part of the proposed rise to the fact that the Corporation had lost profits on its trading undertakings. A year ago there was the equivalent of a 6d. rate relief from the profits of the gas undertaking, and two years ago the rates were relieved to the extent of 4d. in the pound from the electricity undertaking.

The Lord Mayor of Nottingham (Ald. W. Sharp) spoke of the contribution made towards the city's progress by Metropolitan Gas Meters, Ltd., of Nottingham, by whom he has been employed for 45 years, when he attended the firm's staff dinner on January 27. The dinner celebrated the 50th anniversary of the Company under its present title. Among those present were the Lady Mayoress, Mr. F. C. Heley (Chairman), Mr. H. L. Burnie and Col. R. H. Studholme (Directors), Mr. H. Adcock (General Manager) and Mr. E. Bates, Sales and Service Superintendent of the Nottingham undertaking.

A Visit to the inside of the North Thames Gas Board's waterless gasholder at Battersea by Mr. Brian Johnston was featured in the 'In Town Tonight' programme of the B.B.C. on February 25.

R. and A. Main, Ltd., of Falkirk, are completing a modern baths installation for employees in their plant as part of their programme of staff welfare. This new installation follows the now accepted system of permitting workers to arrive in clean clothing, change into working clothes, bath after work, and change back into clean kit.

The British Welding Research Association 'Research and Production' Exhibition, which was held at the London headquarters from February 7 to 11, was considered by the Association to be a great success. A total of 1,256 visitors viewed the exhibition, including representatives of some 303 non-member firms. The total of 179 technical enquiries received during the course of the exhibition are being dealt with by the staff of the liaison and development department.

Householders in some new housing areas in Glasgow who have illegally connected a gas supply to their cooking stoves, have been warned that the practice is dangerous and might cause loss of life. Householders without gas because of a strike of fitters are said to have connected a supply themselves, without gas meters having been installed. Mr. D. F. Young, Divisional Controller, Scottish Gas Board, Glasgow, said that the board would take no responsibility for any damage, and was anxious that the tenants should realise it was dangerous to use gas which had not been properly connected. If the tenants would not take this warning, the board would take steps to stop the supply of gas used in this way.

More than 1,000 entries were on show at an arts and crafts exhibition organised by the Central and Northern Clubs of the Gas Light Sports Association (North Thames Gas Board) at the Royal Horticultural Hall, London, on February 17 and 18. The exhibits included examples of cabinet making, carpet making, photography, needlework, model making, pottery, and glass blowing. Our photograph shows Mr. Michael Milne-Watson, Chairman of the North Thames Gas Board, examining some of the pottery actually made at the exhibition. The potter is Mrs. B. W. Dawkins; Mr. Dawkins is on the left.

Gas in France

By Our Own Correspondent

THE most interesting feature of the January *Journal des Usines à Gaz* is M. R. Dury's survey of the Annual Statistics for 1948. The Editor underlines the figure for the tonnage of coal distilled per man which in 1946 was 233 tonnes and which rose to 329 tonnes in 1948. He remarks: 'It is a pity that these figures do not receive the publicity they merit. The daily Press, so contemptuous of the nationalised enterprises, might find in them reasons to revise an opinion too systematically unfavourable.'

The year 1948 was marked by relaation in the régime of authorisations. From the month of July the monthly allocation of coal to the gas industry was increased by 10%, from 400,000 to 440,000 tonnes. At the same date, the minimum gross calorific value was fixed in principle at 4,200 cal/m³ (440 B.Th.U./cu.ft.) against the previous 3,900 cal/m³ (408 B.Th.U./cu.ft.), some undertakings having obtained for technical reasons indulgences from the Service of Mines. The gas industry together with gas-making coke oven plants have carbonised 4,867,500 tonnes, an increase of 571,300 tonnes over the total of 1947. There has been a reduction of 24% in the use of petroleum products. Technical modifications have led, in most of the big undertakings, to the substitution for gas oil of paraffin distillates which represent in 1948 more than 40% of the tonnage of petroleum products used.

The production of gas rose to 2,538 mill. m³ (89,630 mill. cu.ft.), 72 mill. m³ (254 mill. cu.ft.) more than in 1947 Following the increase in the calorific value the yield of gas per ton of coal distilled was reduced from 574 m³ (20,300 cu.ft./ton) in 1947 to 523 (18,500) in 1948. The total production of coke was 3,709,000 tonnes, an increase of 15% on 1947. The heating of retorts, the manufacture of additional gas and miscellaneous uses absorbed 43% leaving 57%, say, 2,105,000 tonnes, available for sale. The production of tar rose by 21%, benzole 23%, and sulphate of ammonia 13% above the results of 1947.

The purchase of gas from colliery and steelworks coke ovens was 430 mill. m³ (15,185 mill. cu.ft.), less by 4 mill. (141 mill. cu.ft.) than in 1947, the diminution being confined to undertakings not nationalised. The volume of natural gas purchased (at a calorific value of 9,000 calories =942 B.Th.U./cu.ft.) rose by 5%; 53.7 mill. m³ (1,897 mill. cu.ft.) against 51.2 mill. (1,808 mill. cu.ft.). Purchase of propane rose to 174,000 m³ (about 6 mill. cu.ft.) at 24,000 calories, say 2,500 B.Th.U./cu.ft., from 106,000 m³ (about 3¼ mill. cu.ft.) in 1947. Finally, importations of gas from Belgium were 17 mill. m³ (say 600 mill. cu.ft.) against 13,800,000 m³ (say 487 mill. cu.ft.).

In June, 1948, began some relaxation in controls and allocations of solid combustibles, notably coke. Sales of gas and oven coke rose to 2,100,000 tonnes against 1,615,000 tonnes in 1947, an increase of 30%.

Increase in Gas Sales

Gas sales in 1948 reached 2,721 mill. m³ (96,091 mill. cu.ft.), an increase of 3% on 1947. But if allowance is made for the successive increase in calorific value in 1947 and 1948 the increase in sales is really more than 10%. Sales of gas to domestic and commercial users did not sensibly increase, but there were increases of 19.28% in industrial sales, 14.31% for motor fuel, 32.47% public lighting. Reckoning sales in 1938 as 100, sales in 1945 had sunk to 86, rising to 118 in 1946, 129 in 1947, and 138 in 1948. The total population served with gas rose to 20,583,000. The number of consumers rose from 4,972,000 in 1947 to 5,091,000 in 1948, of which the number of domestic consumers was 4,970,000 against 4,858,000 in 1947. Consumption per capita rose from 94 m³ (3,320 cu.ft.) in 1945 to 132 (3,710) in 1948 and per consumer from 418 (14,760) to 536 m³ (18,930 cu.ft.).

Statistics relating to domestic appliances show a sensible increase in the number of appliances in use for the first time for several years. It is, however, difficult to get exact figures on this point in the absence of an annual census of appliances which would be a difficult operation if not impossible when it is a question of a census over nearly 5 mill. consumers. Commercial consumption, in large scale kitchens, bakeries, cooked meats, and laundries showed an increase of 10%. Industrial consumption showed an increase of 15% following one of 12.8% in 1947.

The number of effective personnel, including temporary employees, showed a reduction of 1,000 compared with 1946. Permanent effective employees were reduced from 33,470 in 1947 to 32,149 in 1948, a reduction of nearly 4%. This result is the more remarkable since the tonnage of coal treated rose by 14%, the sales of coke by 3%, the production and sale of gas by 30%.

Price Grading

The movement and grading of gas prices is discussed. The details are of little interest to British readers. The decree of October 29, 1948, fixing the selling price of gas has effected some improvement in the preceding unsatisfactory conditions, re-establishing freedom in the formulation of contracts for uses other than that of the domestic kitchen, but its publication was too late to have a sensible effect on the average price realised in 1948. In 1949 its application will produce a co-efficient of increase over 1938 of hardly more than 8, while the co-efficients for costs of manufacture will vary between 21 for coal and 11 for wages, while the increase in the price of gas for the domestic kitchen, representing 70% of total sales, is limited to 25% above the previous rate.

The authorities have thus implicitly recognised the insufficiency of the prices of gas. Parliament has also undertaken to put an end to this abnormal situation in the first Act of the year 1949 which enacts that the Government shall gradually remove the deficit of Gaz de France and the gas undertakings by a revision of tariffs of services of all kinds rendered by them, but 1949 has passed away without the appearance of any decree giving effect to this law.

Statistics from the period from January 1 to November 30, 1949, are compared with those of the similar period of 1948. The variations are small except that there was an increase of 7% in the production of coke and of 11.8% in the volume of gas purchased from coke ovens. There was a reduction of 3% in the volume of gas made for sale, but if correction is made for its increased calorific value the production in terms of gas-calories increased by 1.7%.

M. Dury concludes that a study of the statistics for the year 1948 confirms the encouraging results of preceding years and proves that the gas industry in France is developing continuously in all sections of its activity. He notes, further, that the gas industry heads the table of monthly indexes of production in the basic industries of the country. On the basis of 100 for 1938, gas stands at 155, electricity at 139, chemical industries 128, and other industries lower. Since January, 1949, the gas industry keeps its place with the record figure of 179 in January and 175 in October, while the average for the whole of French production was 119 and 120 for the same months respectively. These results are the more remarkable in that they have been obtained, not by an increase in manpower, but thanks to an improvement in efficiency shown by a considerable increase in the number of cubic metres made and distributed per man employed.

Rationing of Gas

The year 1949 has been marked by two important events. On the one hand liberty of sale, if not liberty of price, has been restored to solid mineral fuels and notably to the coke market. On the other, control of rationing of gas has been relaxed though some restrictions still remain in the fields of central heating, industrial uses, and in certain districts where gas supplies are temporarily insufficient. In the domain of production and sale, therefore, the gas industry finds itself operating once more under conditions nearly comparable to those of before the war. But it must not be forgotten that the plan of equipment of the gas industry, an integral part of the Monnet Plan, envisaged the doubling in 10 years of the sales of 1938. It must not be forgotten either that the plans for the modernisation of the electrical and petroleum industries are ambitious and that, for instance, for domestic uses, the planned increased consumption for 1952 of 2,000 mill. kWh and of 120,000 tonnes of butane are equivalent to 900

(*Continued on p. 535*)

MAKING THE BEST USE OF EXISTING GASMAKING PLANT AND PLANNING EXTENSIONS WITH MAXIMUM ECONOMY

Following is our report of the discussion on the paper on 'Making the Best Use of Existing Gasmaking Plant and Planning Extensions with Maximum Economy' which Mr. S. K. Hawthorn, Divisional Engineer, Birmingham Division, West Midlands Gas Board, presented at a meeting of the Midland Association of Gas Engineers and Managers at Birmingham on February 16, (*Journal*, February 22, pp. 468-474). The President, Mr. S. J. Sadler (Solihull) was in the chair.

MR. **Fras. C. Briggs** (Divisional Manager, Wolverhampton, said the Association was under a great debt to Mr. Hawthorn for his concise, thoughtful, exhaustive, and provocative treatise, the result, he suggested, of many years of investigation and study both by the author and the staff of the Birmingham District. It was one of those papers which looked simple at first sight, but after deep study one realised how much had gone into the making of it. There were many points on which there would be general agreement; for example, the remark that 'it would be a boon to the gas industry if major retort repairs could be speeded up to cover a period of not more than six months from shut-down to recommencement of gas-making.' He echoed that sentiment with clarion voice and regarded it as the kernel of the paper.

There was only time to deal with general principles, and these seemed to him to fall into three sections. The first was that because of the very high capital cost of plant they should endeavour to secure from the plant the maximum thermal output. Nobody could disagree with that, but it was nothing new. Ordinary industrialists had been appalled by the enormous capital they had to employ in the gas industry compared with their annual turnover. They had to sell gas and they always had to have capital charges in the forefront of their regard. It was a matter that might need emphasising today, but it was not new.

His second point was that the author had said that interconnection of works which was likely to be expedited by nationalisation would lead to a lower margin of spare plant. He suggested that that point should not be over-emphasised. They had always had continuity as one of the main planks of their platform and they should avoid their competitors' attitude that they could take all the loads that were offered to them because they could shed them so easily. The gas industry had been wise in refusing loads that it could not safely carry, and they should not overdo the cutting down of the margin of spare plant. So far as he could see the author had not mentioned the cost of the capital charges involved in interconnections, which were likely to be a big item on the adverse side. He agreed that one of the advantages of interconnections was that they could put in economical extension units which would represent a smaller proportion of capital charges. The greatest value lay in the levelling out of trade fluctuations. Leather in Walsall, heavy industry in Dudley, and glass in Stourbridge did not all go up and down at the same time, and an inter-connection between such places would enable the gas industry to deal more evenly with the varying demands. Mr. Hawthorn had stated categorically that it was not economical to produce blue water gas in vertical retorts; he was going to leave others to deal with that point. His third point was that they should have peak load plant of low capital cost, and therefore it should be either blue water gas, carburetted water gas, or producer gas; it should not be producing the same gas as the base load plant.

Rapid Onset of Peak Load

The author had given examples of the effects of adding diluents which, while increasing the throughput, might have an effect on the usage of the gas. He had spoken of the peak between the end of November and mid-March varying from 87% to 100%, but it should be remembered that the peak might come very rapidly. Elsewhere in the paper he had mentioned that drastic alterations in retort house conditions needed an appreciable period to reach stability. When the peak came suddenly they could not readjust their retort house conditions to increase calorific value and add diluent; they had to put on their peak load gas, which had to be carburetted water gas or producer gas. Then they had to increase the oiling of the existing carburetted water gas, and they had to change their specific gravity. By changing materially the combustion characteristics of their gas they were abandoning one of the main postulates of the gas industry. If they were going to depend on carburetted water gas they should always have a spare set because such plant was liable to pack up at short notice, and that in turn would affect their capital charges for peak load plant. He did not accept the position that they must always feed their carburetted water gas plants with the coke which was the most easy to sell, namely, the big coke. They ought to be able to use the coke that was less easy to sell—the smaller coke—for that purpose.

Had time permitted he would have liked to argue the question as to whether week-end scurfing was incompatible with regular routine hot repairs. Mr. Hawthorn had also mentioned the proper utilisation of gasholder storage to assist in increasing the quantity of gas available to the district. They were, however, facing a new factor in the five-day week. It was impossible to operate their plant fully throughout the week and they were being forced to consider the installation of additional gasholders, which again brought into the picture the question of heavy capital costs. Mr. Hawthorn was a gas production specialist and he had gone out chasing the cheapest therm. He could almost imagine hearing a voice from the past exclaiming 'One B.Th.U. is as good as another,' suggesting one slight danger inherent in large organisations. He could imagine a salesman coming and giving them a paper on the need for gas of constant characteristics, which was all very desirable, but such a paper would not take account of the cost of producing such a gas. In the past every undertaking had recognised the necessity of examining all these factors, but things would be different in the new set-up. They would all become specialists and an extremely heavy responsibility would be thrown on the administrators to balance the desires and the views of the specialists, all of which would be quite imposing.

Water Gas and Fuel Economy

Mr. **J. E. Wakeford** (Divisional Manager, Birmingham) said what had intrigued him most about the paper was the possible application of certain points made by the author to the area as a whole. The West Midlands area, with its 71 undertakings, was carbonising something of the order of 3 mill. tons of coal per annum and producing for sale something like 1,200,000 tons of coke. There must be a limit to how long they could go on making more gas and selling it, and producing more coke and selling it; his own opinion was that they were very near that limit now, if not already there. The area was already committed to carbonising plant extensions and additions which in themselves would require another 70,000 tons of coal a year; just where that additional coal was coming from he did not know. Even now they had difficulty in getting the coal they needed. So far as coke was concerned those plants which were already 'on the stocks' or on order and would be in commission in the next two or three years would make another 30,000 tons of coke available for sale every year, and yet it was well known that in the area they had had the greatest difficulty in disposing of their present make of coke. If they took Mr. Hawthorn's figure of a 2% compound increase for the Birmingham undertaking and applied it to the area as a whole the increase would probably be in excess of what he had indicated.

On the question of the percentage of water gas he thought the area board had laid it down that 40% was a reasonable figure for water gas in total gas. Last year's figures showed that in the area the total percentage for the whole year was only 14%. He submitted that so far as any extensions which were going on in the area were concerned it might be well to

limit them to water gas plant in the first instance, at any rate until they were somewhere nearer to the 30% or 40% which had been suggested. Capital cost was, of course, of great importance to the area board. The capital cost for carburetted water gas plants on the basis of 50% standby plant worked out at something of the order of £70,000 per mill. cu.ft. of capacity, and if an increase at the rate of 5 mill. cu.ft. per day over the next 10 years were required the capital cost would be of the order of £3½ mill. If it was decided that the extensions should consist of coal gas plant, providing the coal was available and the coke could be sold, it would cost £200,000 per mill. cu.ft. of daily capacity, or £10 mill. in all. Mr. Hawthorn had been very fair in his comparisons of costs. Taking water gas, for instance, he had put the price of coke at a reasonable figure.

There was one point in the paper he would like to stress so far as carburetted water gas plant was concerned, namely, that it was most desirable that adequate provision should be made in the new installations for the use of crude oil. It was realised that when the new refineries which were nearing completion were in operation in this country there would be large quantities of crude oil available at a low price. The author had used present-day prices in his calculations, but they all hoped the time was not far distant when there would be a reduction in the price.

Pre-Nationalisation Caution

Mr. **J. H. Dyde,** Vice-President of the Institution of Gas Engineers, President of the Southern Association of Gas Engineers and Managers, and Deputy Chairman of the Eastern Gas Board, paying his first visit to the Midland Association, said the paper was full of sound planning based on equally sound principles. He was interested to know that in the West Midlands they had experienced similar results from the 'wait and see' policy that preceded nationalisation to those they had met with in the Eastern area. In many respects those circumstances were understandable. The boards of directors, particularly of the smaller undertakings, were in a very uncertain position with regard to their future. They were obviously reluctant to embark on capital expenditure which would have been necessary to renew their existing plant; indeed in many cases even to maintain the essential resetting and other repair work to enable gas output to be maintained on economic lines. Withdrawals from reserve funds were such that at the time the undertakings were vested in the respective boards the whole position was not an economical one. In his own particular area it could be said that many undertakings were not in a sound financial position.

The author had mentioned quite rightly the very high cost associated with the installation of gasworks plant. In his own Presidential Address to the Southern Association he had given some figures which he had obtained from some of the leading manufacturers which showed that costs today were some 160% above those in 1938-39, which meant that plant would cost something more than 2½ times as much as it did in the immediate pre-war years. He agreed with the statement by the author that when they came to install new plant that was very vital they often had to associate it with an increase in price of gas because the servicing of the capital involved a greater expenditure than the amount of saving effected by the more efficient production of gas. Mr. Hawthorn had mentioned that the costs were inevitably high because the plant was not always fully employed. He would go further and say that the costs began as soon as they got their first account from the manufacturer, and from the time the manufacturer began his work it was probably two years before the plant was making gas, or at any rate brought into anything like reasonable producing capacity. In the meantime the capital had to be serviced, and at a time when they were all trying to put in new plant it was a serious item.

Reduction of Standby Plant

The author had properly pointed out that where they could effect linkages they could reduce the amount of reserve plant; that, he thought, was one of the main objectives of linkages, particularly where manufacture could be concentrated by shutting down a number of smaller works where the cost of gas making was abnormally high. A great deal of the saving was lost in the capital and depreciation costs of the linkages themselves. He thought they would have to face the day when re-setting work must be spread over the full year, and not concentrated in the six months or so which had been suggested. They had to look at the matter from the manufacturers' point of view. It was very difficult under present-day labour conditions to concentrate work of that type into a few months. In facing up to the prospect of the work being spread over the year he thought they might reasonably hope for the work being done better. Under present conditions much of the work was rushed and that fact was responsible in so small degree for the premature failure of the refractory material.

The author had mentioned the conditions in which certain small works had developed as a result of war experience and increased demands in subsequent years, where it was necessary to reconstruct the works completely because no suitable linkage could be put forward as an economic proposition. They had a number of such cases in the Norfolk, Suffolk, and other rural sections of the Eastern area, where it was difficult to decide on the type of carbonising plant or gas-making plant most suitable in all the circumstances. At last year's meeting of the International Gas Union he put forward the suggestion that at works up to a certain size instead of adhering to the traditional type of retort they might produce gas more economically by the use of complete carburetted water gas plants. There they had a system which was entirely modern, economical in output, involving little labour, and where the labour itself was not arduous; certainly not so arduous as that involved in operating the stop-ended retorts of which they had so many in the Eastern area. There was a case, too, on the small and medium sized works for the introduction of the intermittent vertical retort which would provide, so far as he could see, the best solution of their present problems. Some of the manufacturers had come forward with plants which were giving extremely good service with relatively low labour cost and a very good cost per therm and, what was more, a very extended period in which the refractory materials stood up to their duty.

The Ideal Diluent

The author had made a statement that steaming beyond the optimum limit reduced the therms produced per retort per day. He agreed with him, but the whole point was to know where the optimum limit lay, and there was considerable variation in that respect. Considering the wide range of coals used today and the variety in types of plant available he was of the opinion that it was most economical to make a rich gas in their continuous vertical retorts and dilute it with a diluent gas produced in an external plant. In the case of the very small works producer gas was the ideal diluent in that it required no extra labour.

On the construction of new works they had to consider nowadays the requirements of the various regional planning authorities. At a place like Cambridge the most suitable plant might be a continuous vertical retort installation with dust control extended to the limits, and housed in an attractive building. On the other hand on an industrial site such as they had at Tottenham they could go ahead with an intermittent system and need not spent very large sums of money on the architectural characteristics of the retort house.

Mr. **T. C. Finlayson** (Chairman of the Woodall Duckham Vertical Retort and Oven Construction Co. (1920) Ltd.) said if he understood Mr. Hawthorn correctly the main argument of his paper could be summed up in a single sentence, namely, that when facing extensions to gas-making plant, carburetted water gas plant was generally to be preferred to coal gas plant if the existing proportion of carburetted water gas was materially less than 33% of the total gas-making capacity of the works. To justify such a statement must imply, and in fact Mr. Hawthorn's ideal chart showed it to be the case, that the carburetted water gas plant must be regarded as a base load plant, operated throughout the year, as well as being a peak load plant.

Strategy and Economics

The position of carburetted water gas as an economical means of providing peak load gas was established beyond question, and also as an economical means of providing diluent gas on large gas-making stations where the gas-making plant was, for example, coke ovens. In fact in a paper to the Institution of Gas Engineers two years ago he showed that as the annual output of gas undertakings increased, the proportion of the undertakings which made water gas increased. All undertakings which had annual outputs greater than 2,500 mill. cu.ft. obtained a portion of their requirements from water gas plants. Mr. Hawthorn's main statement could, it seemed to him, be examined from two entirely different aspects—strategy of gas production and economics of gas production. It must be remembered that a certain policy might be good strategy while being economically disadvantageous. On the

other hand a policy might be economically advantageous but strategically unsound.

For a plant designer avowedly interested in coal carbonisation to speak on the strategy of gas production might be somewhat bold but he ventured to offer a few comments. Mr. Hawthorn seemed to him to have based his arguments on very large scale operation, the significance of which he had not emphasised quite as clearly as he might have done. In other words, in order that he could apply his ideal load curves shown in Fig. 2, he must select a size of works which could afford to keep both a carbonising plant and a water gas plant in continuous operation for 24 hours per day throughout the year. Further, he must provide standby plant to the water gas plant so that at any moment it could come into commission seeing that it was a base load plant. He imagined that there was a clearly defined lower figure in output per day which would therefore justify that method of operation.

Gradual Evolution

Although Mr. Hawthorn's plans for future gas-making plants with capacities of 20 mill. cu.ft. per day and 40 mill. cu.ft. per day on new sites had his enthusiastic support he felt it was only fair to remind him of the fact that the *average* size of his own company's last 100 orders for new carbonising plant was 2 mill. cu.ft. per day. In other words, the industry was still going through a period of gradual evolution and what might be possible on very large works was not so attractive on the average sized works. Two other aspects of strategy came to his mind. It seemed rather strange to him that one of the advantages claimed for Mr. Hawthorn's ideal methods was that it produced less coke, especially Birmingham type coke, while at the same time the National Coal Board was exploring ways and means of providing the solid fuel requirements for the home as envisaged by the Simon report. It was worth remembering that the relative demands for gas and coke using modern appliances had not yet been tested under conditions where economy of personal expenditure was the main incentive.

His further point was that extension of base load gas production on a national basis dependent on imported oil seemed to him contrary to the remit to the Gas Research Board to develop home-made enrichers. The development of the home refining of oil did not alter the fact that the coal was *here* and the oil was *there*. Building plants to supply base load gas dependent on imported oil was a long term policy. Could the Ministry of Fuel and Power give Mr. Hawthorn the necessary long term assurance to justify such policy? Dealing with the economics of water gas production for base load purposes, the author had summarised his views which led him to the conclusion that his arguments were justified economically as well as strategically. He (Mr. Finlayson) confessed that he found some difficulty in following his calculations.

Comparative Costs

In order that comparative costs of gas-making methods might have permanent value it was desirable to state how the various figures had been arrived at. The author would remember that he (Mr. Finlayson) had been associated with two papers in which the matter was discussed and in which the basis of computation was set out. To add to the permanent value of his paper he suggested that Mr. Hawthorn should amplify his calculations in an appendix. For example, if the carburetted water gas plant was to operate as a base load plant throughout the year and therefore be available for continuous load the capital charge must allow for the necessary standby plant. He mentioned this fact because Mr. Hawthorn gave figures in which the relationship between the capital costs for coal gas base load and that of water gas base load had changed considerably since the earlier consideration entitled 'Perspective in Carbonising Costs' presented in 1934 by Mr. F. B. Richards. He would have thought that a carburetted water gas plant provided with all standby plant to give continuous load would have cost more than 31% of a modern carbonising plant and auxiliaries.

Equally he found it somewhat difficult to build up the coal gas production cost, without capital charges, when working at full throughput to 7.4d. per therm. It was possible to oversimplify a most complex problem. He thought the author had made his case that for each extension consideration should be given to the relative merits of coal gas and water gas plants taking into consideration size of extension, coke markets, oil prospects, coal prospects, and economics, but he thought it would be unwise to get in one's mind any single answer for general application.

As the paper was certain to be studied for many days to come he wished to offer one or two minor corrections. In his table on type of carbonising plant, Mr. Hawthorn limited the range of coal for coke ovens to a minimum swelling No. 7. This was too high, and good cokes from blends with swelling No. 4½ were being marketed. On the other hand the range was too wide for intermittent verticals. It was impossible to discharge a coherent coke from a coal with a swelling number less than, say, 3. The relative fuel consumptions were also somewhat misleading. A fuel consumption of 12½% on a non-recuperative continuous vertical retort was associated with twice as much waste heat steam as the same fuel consumption on a recuperative intermittent vertical chamber, and the 11% fuel consumption on regenerative coke ovens was associated with no waste heat steam.

Benzole Extraction

When discussing benzole extraction, Mr. Hawthorn mentioned that this led to increase in coal required and coke made by 16½%; actually, the coke made was increased by 24% because more coke was made per ton due to less steaming and fuel consumption was lower at higher throughput. The high capital cost of modern carbonising plant had worried the plant designer in recent years when demands for improved amenities for the workers and reduction in their manual effort, improved appearance of retort houses, desire for division of plant into smaller repair units, and so on, had all led to increase in capital cost. Unfortunately, all these benefits were intangible when expressed in cost per therm. It might be worth placing on record that the capital cost of a modern continuous vertical retort plant provided with all amenities was at least 25% more acceptable; in other words, simplification by the buyer was the most practical means of reducing capital costs of carbonising plants.

Mr. **F. H. Bate** (Divisional Engineer, Wolverhampton) referred to the dilution of coal gas by the use of blue water gas or producer gas produced externally, and said it should be remembered that the processes of dilution generally reduced the efficiency of carbonisation, except in the case of horizontal retorts, although dilution might be necessary in order to meet the demand. It was generally claimed on behalf of the gas industry that the carbonisation process was more than 75% efficient, the carburetted water gas process more than 65% efficient, and the blue water gas process more than 60% efficient, all on a thermal basis. He was aware that higher figures could be achieved for these processes, but the figures given represented the minimum performance which could be guaranteed at all times; therefore, however necessary some of the processes might be to carry undertakings through difficult periods, in most cases there would be a reduction in carbonising results.

From figures given by the author with regard to the effects of adding diluents to coal gas it could be assumed that retorts under normal conditions would produce at least 17,000 cu.ft. per ton at 450 B.Th.U. per cu.ft., *i.e.*, 76.5 therms per ton. If steaming was reduced and the calorific value was allowed to reach 475 B.Th.U. then by direct calculation the make per ton of straight coal gas would be 14,700 cu.ft. to the ton only. If this gas were reduced to 450 B.Th.U. by the addition of producer gas at 125 B.Th.U. the final make per ton at 450 B.Th.U. would be 15,830 cu.ft., or a yield of 71.2 therms per ton of coal plus the extra coke used in the producer plant.

The Argument for Dilution

The paper showed that the addition of producer gas increased production by 7.7%, but it was accompanied by a drop of five therms per ton on all the coal carbonised in that case. The argument for dilution was that it saved the capital cost of new carbonising plant, but he would like to see a balance sheet comparing the capital charges on plant against the losses incurred in depreciation of carbonising results.

A simple way of considering the implications of all this was to consider the author's balance sheet for a suggested works with continuous vertical retorts making a maximum of 20 mill. cu.ft. per day. No tar figures were given but if normal figures were assumed and the figures used in the F.E.I. calculations were taken, the efficiency of the suggested works was only about 75%, which was far less than could be achieved with a modern carbonising plant and the efficient generation and usage of waste heat steam. He agreed with the author that circumstances might enforce a policy of dilution, but he thought such a policy should not be planned for a new

works. Again there were practical limitations to the deliberate reduction of steaming. With normal throughputs the sensible heat of the coke was sufficient to provide most of the heat to pre-heat the steam to the temperature required for reaction. If enough steam was added to keep the bottom ironwork cool and enough water to quench the coke then the amount of resultant steaming was generally adequate to reduce the calorific value to approximately town gas figures. Any substantial reduction of steaming or quenching might result in a coke dust nuisance, cracked settings, or distorted floor joints.

Regarding figures for costs of gas production, Mr. Hawthorn had demonstrated that with a high load factor the conventional carbonising plant produced the cheapest therms. It was only when peak loads were considered that alternatives became desirable. To his mind the whole argument depended on the capital charges on the water gas plant. When the various cases were examined it could be seen that at various times the carburetted water gas plant would be required to work at maximum production for long periods without standby, and the production would be equivalent to 40% carburetted water gas in town gas. Any breakdown even of a temporary nature would jeopardise the continuity of supplies. A works could not be planned without any reserve for this important production, and if duplicate carburetted water gas machines were provided their cost would substantially increase the capital cost on the carburetted water gas production. In a very large undertaking one machine could act as reserve to ten or more machines, but in a medium sized works the reserve must assume greater proportions—possibly one machine to two at work.

Apportionment of Overheads

Capital charges involved in the provision of the necessary standby would tend to make the capital costs on carburetted water gas plant approach the capital costs of carbonising plant. He was aware that the author had suggested that in the event of a breakdown of carburetted water gas then the blue water gas plant could be put to work as a c.w.g. machine and a standby producer plant put to work, but in such cases a portion of the cost of the blue water gas machine plus carburettor and the producer gas plant should be debited against the capital account of carburetted water gas. The author's carburetted water gas production cost figure of 8.55d. per therm included overheads, but did this include a proportionate share of all the works overheads, such as tradesmen, painters, carpenters, stores attendants, gatekeepers, and so on? In a comparison between coal and water gas these charges should be apportioned pro rata to the gas made.

A recommendation was made that carburetted water gas should be included up to 33% of the total productive capacity. This was based on an analysis which showed that when carburetted water gas was 22% of the plant capacity the cost was 9.48d. per therm; when it was 33% the cost was 9.4d. per therm; and when it was nil the cost was 10.64d. per therm. With a difference of only 0.08d. per therm between 22% and 33% he suggested that the recommendation should be widened to cover 22% to 33%. With the continued steady growth of undertakings the peak load plant of today became the base load plant of tomorrow.

Potential Demand

Output in the Wolverhampton Division had been compared on a population basis with the output in the Birmingham Division and from the figures it could be inferred that the potential demand over and above present outputs was of the order of 3,000 mill. cu.ft. per annum. It would therefore appear that at least in one part of the area the paramount need was for base load plant which would be operated at a high load factor. The policy in regard to production plant must vary from one division to another.

Mr. **W. T. Newton** (Divisional Engineer, Walsall and District Division) added to the author's remarks on nationalisation and subsequent co-ordination the suggestion that interlinking of works would enable economies to be effected by the selection of the most efficient plants for operation. The retention of small works in operation could be justified when the plant was in good condition and the cost of production was reasonable, even if there was no room for extension. In his division there was such a works where the peak load deficiencies were met by a bulk supply from a neighbouring works. They had under consideration the retention of that works in operation in order to save the high cost of replacing the existing capacity by extensions at the other works.

He could confirm Mr. Hawthorn's statement that increased throughput in continuous vertical retorts paid. At one of the works in his division they calculated that a lower throughput per retort per day, with a consequent increase of 1,400 cu.ft. of gas per ton, increased the cost of gas by 0.1d. per therm. The cost of coal was 56s. per ton and the price of coke was 68s. At that particular works it was impossible to make 500 B.Th.U. gas in the vertical retorts, due to the fact that over 90% of the coal came from the East Midlands. The maximum quality possible was approximately 490 B.Th.U.

Labour Shortage

He was surprised at the author's statement that major repairs to carbonising plant took 8 to 8½ months. In his own experience the normal period for a complete rebuilding of a continuous vertical retort setting, including repairs to producers and to top and bottom ironwork, was five, and at the most, six months, providing the necessary labour was available. It was increasingly difficult for contractors to find sufficient skilled labour for the avalanche of retort setting repairs in the summer. Unfortunately, when a large labour force was recruited the men could not be retained through the winter in readiness for the next summer repairs. The shortage of skilled labour meant that at some works the period of repairs was extended beyond the autumn or the repairs had to be started at an inconveniently earlier date. The problem was serious and the only solution was for undertakings to install sufficient gas-making plant for some repairs to be executed in the winter. A works in that fortunate position would benefit by having available the best skilled workers. In his opinion unless additional spare plant was installed, seasonal repairs at some works would be impossible, having regard to the noticeable tendency of normal summer loads increasing at a greater rate than normal winter loads. It seemed necessary for the problem to be considered at area level, or preferably at national level, as was now possible in a nationalised industry, in order that the necessary skilled workers could be maintained in continuous employment.

The author had given relative costs of coal gas and carburetted water gas, showing that coal gas was 1.15d. cheaper per therm; in the Walsall division they found a bigger difference. At one works in the division the cost of coal gas was 3d. less per therm, the calorific value of the gas being 475 B.Th.U., and at another works the coal gas was 2.2d. per therm less, and the calorific value in that case was 450 B.Th.U. In the first case the carburetted water gas plant had a capacity of half a million cu.ft. per day. In calculations made in connection with large developments at another works coal gas was expected to be 2.5d. per therm less than carburetted water gas.

Reference was made in the paper to mechanical producers. On several occasions he had studied the operation of the latest designs of mechanical producers in France and during the last three years he had assisted in the preparation of costs in various parts of the country. Costs were considered for various sizes of plants operating on different coals, and it was difficult to justify mechanical producers on purely financial grounds. The fuel figure was higher, due to the temperature of the gas entering the setting being lower than with step grate producers. It was possible to gasify small coke, but the fuel had to be graded and it was necessary to increase considerably the size of the producer. In practice mechanical producers were more selective as regards fuel than step grate producers. There were many advantages, however, such as uniform quality of producer gas, less carbon in the ashes, no arduous labour, and in some cases a small saving in cost of labour. He had studied with interest the author's comparison of continuous verticals, intermittent verticals, and coke ovens, and in connection with intermittent vertical chambers he would add that they gave more therms per chamber per day the higher the calorific value of the gas within reason. Over the range 450-550 B.Th.U. per cu.ft. the volume of gas per chamber was fairly constant.

Mixing Three Gases

In his suggestions for new works the author favoured making three different gases, namely, coal gas, blue water gas, and carburetted water gas. He wondered why he preferred to do that, instead of making two different gases such as coal gas and carburetted water gas, and he assumed the answer would be to refer him to the last page of the paper, where he stated that if blue water gas was produced externally instead of inside the retorts it should not be included in the normally permissible figure of 40% water gas in town gas.

The cost of production was the same in each case, and it should be easier to make and control two instead of three different gas qualities and volumes.

Mr. **J. M. Hawes** (Humphreys and Glasgow, Ltd.), after apologising for the absence of Mr. H. S. Cheetham, said the paper clearly illustrated the wisdom of planning in advance the tactical use of carburetted water gas as a coal gas auxiliary, in order that having regard to seasonal load fluctuations and a regular repair programme each plant might be operated at the highest practical load factor, thus reducing capital charges to a minimum.

As Mr. Hawthorn had stated, the usefulness of the conventional carburetted water gas plant could be further enhanced on the one hand by taking advantage of a special feature now available, which enabled enrichment to be extended, allowing the production of a gas of 600 B.Th.U. per cu.ft. or more during periods of peak demand, and on the other hand by taking advantage of periods of low demand to gasify small sizes of coke. The effect of the reduced generator efficiency on the costs of water gas when using smaller sizes of coke might be more than offset by the lower costs of the coke, since it appeared that if the small coke was a drug on the market it must be charged to the water gas plant at a lower cost than large coke which could be readily sold.

Value of Adequate Maintenance

Although the modern self-clinkering generator would gasify these smaller sized and sometimes inferior quality cokes without difficulty there was no doubt that the general tuning up and attention to operating adjustments of the water gas plant to suit the fuel and other conditions would pay a handsome dividend. In considering Fig. 2 it was suggested that if high calorific value equipment fitted to carburetted water gas plant were allowed to accommodate part of the load during the peak period in the spring and autumn then the total capacity of the carburetted water gas plant might be reduced, and thus the load factor on the plant would be increased. This would, of course, mean that the gas produced from the water gas plant might exceed the area's stipulated limit of 40% of the total gas made, but since the excess would not truly be water gas but oil gas plus producer gas presumably this would be tolerated. It might be that the high calorific value equipment on the water gas plant should be considered only for supplying exceptional peak loads, which did not occur at regular seasonal intervals.

The author had referred to the advisability of providing carburetted water gas plant even in cases where the plant might be used substantially for the manufacture of blue water gas. It was important to note in that connection that the cost of carburetted water gas plant did not greatly exceed that of blue water gas plant, having a similar generator capacity and efficiency, since apart from the actual oiling equipment the only saving achieved in a blue water gas plant was the omission of the superheater. The small additional cost was undoubtedly justified when it was realised that it enabled a 100% thermal increase in output to be obtained.

Use of Wax Distillate

The author had mentioned that a new carburetted water gas plant should be capable of modifications to utilise heavy oils. It might therefore be opportune to mention that although the use of heavy oil might become attractive on economic grounds or be forced on the British gas industry owing to shortage of distillate oils, the use of such heavy oils would probably be limited to base load plants having generators of fairly large capacity, since the handling of the oil, maintenance of correct plant conditions, and handling and treatment of the tar produced, called for greater supervision than was normally available on small installations. The free carbon liberated when cracking these heavy oils led to formation of tar emulsions, and suitable plant for breaking down those emulsions would be an essential feature of heavy oil installations. As an alternative to heavy oil there might be available considerable quantities of wax distillate. Trials had been carried using this material for blue gas enrichment and the results obtained had been entirely satisfactory and indicated that the enriching value per gallon of wax distillate was similar to that obtained from gas oil. Although like heavy oil this material had to be heated in order that it might be handled, being a distillate it contained no carbon residue and might therefore be substituted for gas oil without modifications to the plant; moreover, it gave no tar problems. While on the subject of water gas tar it was noted that Mr. Hawthorn had suggested that one way of increasing the carburetted water gas plant output would be to reform oil during the backrun phase of the water gas cycle. This was of course possible, but in addition to being an expensive way of utilising oil it led owing to the liberation of carbon, to the same problem in tar handling as did the use of heavy oils.

The author had given a figure of 6.7% to cover amortisation on coal gas plant, taking a life of 20 years, whereas on the carburetted water gas plant the figure was 8.4%, taking a life of 15 years. This seemed rather extraordinary and it was thought that, in fact, the figure for water gas plant should be somewhat lower than that for coal gas plant in view of the fact that the load factor for the carburetted water gas plant had presumably been taken at 50%, which meant that sections of the plant could be stood off for periods during the year. It was also difficult to understand why the ancillary plant for the water gas plant should not have an equal life to that of the coal gas plant. As an example it was interesting to note that a Humphreys and Glasgow carburetted water gas plant installed at the Garston works of the Liverpool undertaking in 1928 had up to the end of 1949 gasified no less than 460,000 tons of coke in the production of 27,500 mill. cu.ft. of carburetted water gas, which incidentally was equivalent to a load factor of about 45%.

Mr. Hawthorn had referred to the problem of renovating and increasing capacity of small undertakings remotely situated from larger works. In many instances the use of small automatic water gas plant, using either gas oil or propane if obtainable at a reasonable price for enrichment would generally be found to be the most convenient and possibly the cheapest way of meeting the increased demand.

Mr. J. M. Brown (Saltley, Birmingham) enquired whether there was a scientific basis for the limitation of 40% water gas in town gas. If it was a question of CO he knew of no evidence with regard to suicides or accidental gas poisoning to support the limitation. Was it a question of the specific gravity being too great to suit the gas salesman; or was it the naphthalene in the gas, which he thought could be controlled?

The Author's Reply

Mr. **Hawthorn,** in a brief reply to the discussion, said he believed there were many instances in which the men in charge of works would find they could get more gas out of their existing plant by attention to some of the points he had indicated in his paper. Mr. Briggs had referred to the high cost of linkages; his reply was that he did not think he had advocated linkages except where works were so bad that they should be shut down. He was strongly of the opinion that it only paid to make a certain amount of water gas in a continuous vertical retort. There was residual heat in the coke enough to make some water gas, but once they had used that heat it did not pay to make more water gas because it meant letting down their throughputs. He was not advocating a peak load gas different from the base load. His idea was that the coal gas plant should work throughout at the maximum output all the time making a high calorific value gas, and that blue water gas or producer gas should be employed to dilute the gas to 450 B.Th.U., which was the same calorific value as that of the carburetted water gas. Lower calorific values were made up by oiling on the water gas plant. Mr. Briggs had referred to variable characteristics of gas. He admitted that they must keep the characteristics as steady as possible, but he doubted whether the effects of variations were as great as some people thought. Producer gas, as a matter of fact, had less effect on the A.T.B. number when used as a diluent than had carburetted water gas. There was also the question of pressures, and he suggested that no distribution engineer could claim that pressures were equal throughout a district, any more than the works engineer could say that the calorific value or specific gravity was constant.

Reliability of Water Gas Plant

It had been inferred that water gas plants were liable to 'pack up' at short notice. The works for which he was responsible operated eight machines and they did not find them packing up. It was true they had occasionally to shut a machine down for a short time, but he failed to understand how the impression came to be created that such plant was unreliable. If proper attention was given to repairs and overhauls water gas plant should not let them down at short notice. Reference had been made to the use of smaller coke, but his reply was that once they reduced the size of fuel to the water gas plant they must be prepared for a big drop in output.

Week-end scaling had also been mentioned. Hot repairs formed an important part of the retort repair programme and it was necessary, except on the smallest works, to have one man responsible for hot repairs. If all the work was left for the week-end it would be necessary to bring in a staff of men to do the work on Sunday. Hot repairs required experts and it was better to employ one man regularly for the work.

He thanked Mr. Wakeford for his outspoken remarks about the future for coal supplies and coke sales. He felt they would all like a first-class complete gasification plant and the complete cessation of coke production. Regarding the use of heavy oil in water gas plants he thought they must all be prepared at some time in the future to use heavy oil in spite of the difficulties which they knew were associated with its use. It was used extensively in America where its use was justified on the ground of cost. When the new refineries in this country were in operation they might find that heavy oil was as cheap as gas oil.

A Vexed Subject

He was glad to find that Mr. Dyde was substantially in agreement with most of his paper; it was important to remember that capital charges became payable long before new plant was actually in operation. The question of carrying out retort repairs in the winter was a very vexed subject. The ideal arrangement would be to carry out some repairs in the winter months, but the capital charges on sufficient plant to enable that to be done would be very great. In the case of coke ovens, repairs were not usually necessary for 15 years, but when they were due they took a full year; the job simply could not be done in six or eight months. Mr. Dyde's suggestion that the small works should produce 100% water gas sounded very attractive, but it should be borne in mind that two machines would be required—not from the point of view of reliability, but from the point of view of repairs. Reference had been made to steaming beyond the optimum point; the optimum point for steaming varied with the type of coal employed. There had recently been a development by the Woodall-Duckham Company in the design of the continuous type of retort whereby a substantial increase in calorific value could be obtained; it was not unreasonable to expect a calorific value of 500 B.Th.U. with good operation, even when using Midland coals.

Replying to Mr. Finlayson, he said it was quite true, as he had inferred, that he had advocated carburetted water gas partly as base load. A small part of his water gas plant was working all the year round, the advantages being that it enabled one to have less plant in total and also to make carburetted water gas in the summer when the difficulties regarding the sale of coke had to be met. He hoped he had made it clear that wherever carburetted water gas was employed there should be two machines at least to allow for repairs. The reason for using producer gas as a diluent was to avoid the necessity for putting in a spare water gas plant. If one had two or more water gas machines and one of them was out of action the producer gas could be used instead, and extra oil gasified in the water gas machines that were in operation.

It should not be inferred from his references to works capable of producing 20 mill. or 40 mill. cu.ft. of gas per day that he contemplated such works coming into full production at any one time. He visualised a start with, say, 5 mill. cu.ft. per day, with additions from time to time of 5 mill. cu.ft. per day until the maximum scheme was accomplished. The imported gas oil the industry was using now did at any rate take the place of some of the coal that was being exported, and personally he thought they could rely on supplies of oil in the future. He saw no means of getting coal carbonising plant affording such flexibility as they were obtaining from the use of water gas, and it was his opinion that water gas production was sound policy. He regretted that he could not give the figures Mr. Finlayson had asked for, but he assured him that they included provision for all charges.

Cheaper Utility Plant

He realised that the elaborate buildings and amenities called for by some undertakings added substantially to the capital cost of coal carbonising plant, but he did not think the figure would be as high as 25% above pre-war costs, because the pre-war standard itself was very high. He suggested that it might be possible to build plant 25% cheaper than at present if they concentrated on utility plant. Mr. Bate had referred to the sales of gas in different divisions and thought that if they put in peak load plant as had been suggested it would be quickly absorbed and become base load plant. It was not wise to assume that every division had a potential the same as Birmingham. Some divisions with almost the same population had less than half the gas output, and it was wide of the mark to expect all divisions to achieve the same standard of output. Where it was known that the service had been bad an improved service would clearly result in a bigger output. He agreed that if producer gas were used as a diluent it would mean using more coal and making more gas, but he had not advocated the use of producer gas as a regular diluent. It was useful as a temporary expedient; he stuck to that statement fully realising the difficulties which had been pointed out.

Mr. Bate had also referred to the low fuel efficiency index for the suggested new 20 mill. cu.ft. works. He would point out that he had not advocated dilution with producer gas for the new works, except as a reserve in case of need. Mr. Bate did not agree with him on the extent to which steaming could be carried out on continuous verticals; on that point he could only suggest that they should agree to differ. Mr. Hawes had suggested that a lower price might be charged for the small coke employed in the production of water gas, but he thought it would be difficult to persuade the accountants to approve a price different from that which was obtainable in the open market. He appreciated Mr. Hawes's reference to heavy oil, and also to wax distillate which, they were assured, was equal to gas oil for any of the duties associated with that oil. They were not quite sure, however, about its availability.

On the question of capital charges, the figures for 15 and 20 years' life for water gas and coal gas plants had been queried. He could only say that they were not his own figures. When they went to the various Ministries for authority to raise new capital they were given a period of life for different items of plant, and the figures which he had mentioned were based on the loan periods granted to them. He did not think they were necessarily right but they were the charges they had actually been called upon to pay.

In reply to Mr. Newton, Mr. Hawthorn said he considered a period of 8½-9 months was necessary for reconstruction. He had commented on the very small difference of just over a 1d. in the costs at various works. Probably some of the works were using very small plant, or working it throughout the 24 hours of the day. He could not altogether agree with Mr. Newton that mechanical producers were more selective than step grate producers. Finally, Mr. Newton had queried the necessity for making three different gases—coal gas, blue water gas, and carburetted water gas—on the suggested new 20 mill. cu.ft. works. Actually there was no precise reason for that; they could make two gases only, and lump them all together, and the final result would be the same.

Mr. **K. L. Pearce** (Divisional General Manager, Leicester and Northants Division, East Midlands Gas Board), Vice-President of the Association, proposed a vote of thanks to the author, to which Mr. Hawthorn briefly replied.

OIL REFINERY DEVELOPMENTS

Under the direction of Mr. S. G. Wraight, O.B.E., General Manager, more than 2,200 are at work on the construction of the large new petroleum refinery for the Shell Petroleum Co., on a 200-acre site at Shell Haven which, with its twin plant at Stanlow, on the Manchester Ship Canal, will handle more than 6 mill. tons of crude oil annually and will produce a complete range of finished products. The target date for the initial operation of the new Shell Haven refinery is November, 1950.

The first distillation plant will be commissioned to process a designed intake of 6,000 tons/stream day crude oil. Notable features of this plant include the high degree of control by instrumentation and the almost complete elimination of steam for operating pumping units, most of which will be electrically driven. Facilities will be provided for treatment of approximately 1,300 tons straight-run petrol from the distilling unit. Also included in the primary programme is the installation of pump and weigh-house fully equipped for intensive T.E.L. blending petrol to the desired octane quality and the production quantity required.

Subsequent additional refining plant includes a reforming unit, at present under construction and which is due to be in full operation by May, 1951. This plant will process some 1,200 tons/s.d. of naphtha, or light gas oil, and will be followed by the installation of a feed preparation plant having a design capacity of 2,500 tons/s.d. for production of bitumen feedstock. Some 50 ft. below the Thames miners are building a 900 ft. long tunnel to carry cooling water which will help operate the refinery. Along this 9 ft. diameter tunnel Thames water will be carried to a pump house 30 ft. below ground level.

CONTRACTING FOR THE GAS INDUSTRY*

By W. H. G. ROACH, M.B.E., A.C.G.I., M.Inst.Gas E., and R. V. STEVENS
(William Press and Son, Ltd.)

CIVIL engineering contracting is now accepted as an essential and organised industry, with a definite contribution to make to the country's economic recovery and continued prosperity.

We think that the first question which will arise in your minds is: Why use a contractor, and what advantages can he give to the execution of the work which we visualise?

Let us consider first the question of the local resources. Most undertakings have a limited staff and skilled personnel, together of course with the appropriate administrative staff which deals with their normal day-to-day requirements, and it is obviously their endeavour to keep this staff permanently and efficiently employed. When work is visualised which would entail enlargement on a temporary basis of this staff and personnel, and where the undertaking's basic load is exceeded, then it must be economical to consider the use of contractors. Let us enlarge on this.

We think we may accept as certain that before a gas undertaking can embark on a programme of direct labour works, at costs equal to those quoted by contractors, it must be assured of enough work to occupy it continuously for an economic period without the likelihood of economy cuts and restrictions during that time, and further it must have available sufficient staff to design and supervise the schemes, enough suitable labour to carry out the works, coupled with the certain availability of whatever plant is necessary for its proper execution.

Under present-day conditions, no nationalised industry can be sure that its capital expenditure programme will not be modified at very short notice, and again, one must assume that the existing staff are fully occupied with their routine commitments, so that any such increase in the activities of the undertaking must entail an increase in both personnel and equipment.

A great deal of the work will probably require specialised knowledge and expensive plant, and without a reasonable period of work ahead the task of recruiting satisfactory technical staff and experienced labour is made most difficult, the purchase of the necessary plant becomes a very doubtful economic proposition, and it is a certainty that neither temporary staff nor hired plant will achieve either the highest standard of work or the maximum economy.

Even with a small job, which the engineer might feel justified in tackling with his existing resources, he is up against the fact that routine works will more likely than not have to take second place for a while and, more directly, his staff and work people start with the considerable handicap of not having the continuous practical experience of the particular job that the contractor can obtain by his much wider field of operations.

Another aspect of the problem is that of individual output of the employee. There may be controversy over the statement that, man for man, the contractor's output is generally higher than the direct labour employee. Let us seek reasons why this should be so.

We all know how terribly wicked one has to be to warrant discharge by the average undertaking. In discussing this matter, one does not want to accentuate the value of the sack; on the contrary, contractors have their welfare schemes and do their utmost to hold their teams together and to decasualise their work as much as possible but, of necessity, the contractor's man must fear for his next job and this gives him an incentive.

Secondly, contractors are able to give bonus on output payments which are an accepted and integral part of the working rule agreement of the industry.

Thirdly, the contractor has to make a profit, and this ensures that he will not countenance slackness in his employees and will try and engender team spirit among his staff. He is, if he is prudent, continually training his younger men and in this the industry has co-operated largely in Government and other training schemes.

Fourthly, while still discussing the uses of contractors, we come to the question of costs. Remember the whole costs of a contractor's organisation go against his work, and it might be interesting to say a few words on how a contractor costs his work.

In contracting there are the firms with a high labour content and a low plant content, as at the other end of the scale one finds the low labour content and highly mechanised firm. As an example of the latter type, one can point to firms on open-cast coal production, which is practically all mechanisation, and as an example of the former one can take a firm such as ours where wages are a high proportion of total turnover.

Overheads on firms such as ours are computed as a percentage of wages, and this overall percentage varies, primarily, with turnover, as obviously the organisation is not decreased proportionately with the decreased turnover and whatever happens the firm is still tendering for work, even more so in slack times, which is a very costly overhead.

In making one final remark on the uses of a contractor, the question of finance arises. The contractor finances his customers over a period of months. It is normal for accounts to be rendered monthly and that means that the earliest payment is in the region of three months. When one considers this in the aggregate one can visualise the finance involved. It is not uncommon for a contractor to be out of his money for six months or more.

Methods

Having decided to put a job out to tender, what is the best method to employ to obtain a fair and equable price and an efficient job?

A contract for civil engineering works, like any other contract, is based on the fundamental fact that in the eyes of the law the parties concerned are free to form their own terms, which, when finally embodied, are acceptable and binding on them both. There is on one side an undertaking to fulfil stated obligations, and on the other a promise to pay certain monies by way of consideration.

In practice, the engineer will determine the conditions of the contract and define the obligations and performances he requires undertaken, these being embodied in a set of contract documents, which it might be advisable to comment upon in some detail.

The first positive step he will have taken will be to have drawings prepared of the proposed works; so let us first deal with this aspect. The standard required will obviously vary in accordance with the type and magnitude of the job, but broadly speaking they must be sufficient to show the whole of the works to be executed under the contract, and should be in sufficient detail to enable the contractor to construct the works entirely from them.

With a major structure, it should be remembered that a simple design, particularly one that will permit repetition work in erection, will result in considerable savings in expenditure. Where excavations are involved, it would help if all possible information as to soil conditions is obtained by the engineer and tabulated on the relevant drawings. In this connection a site investigation code is being compiled by the Building Research Station, and if this is brought into general use it should prove a useful standardisation.

At the other end of the scale, the drawings required for a mainlaying contract need not go beyond a route plan which,

* Paper to the Midland Junior Gas Association, February 14, 1950.

as it cannot give much information other than the points between which the main will be laid, can well be kept to a scale of, say, 1/2,500 with separate larger scale detail drawings of special jobs, such as river crossings, if required.

What is important is that the drawings should all be completed by the engineer. It should not be left to the contractor to prepare design drawings for any work, except possibly in the case of very specialised construction.

A complete set of the contract drawings should be supplied to each firm preparing a tender for the work, as the practice of making only one set available to be inspected at the engineer's office does not give the tenderer sufficient opportunity to study all the aspects of the work.

Contract Drawings

You will appreciate that, of the contract documents, the drawings are particular to one specific job; and in the same way, the next document to be considered, the specification, should also be prepared for each separate contract, for its purpose is to describe in detail the work that has to be done, the character and quality of both materials and workmanship, particulars of any special responsibilities which are not covered by any general conditions, and may also, if required, set out the order and general method by which the work is to be carried out and its time of completion.

It is a document which must be drawn up in such a way that the contractor is not left in any doubt as to exactly what is required of him. The satisfied contractor will always produce the best results, and one of the simplest ways of keeping him satisfied is to ensure that he is in possession of all the facts at the time of tendering, so that he is not called upon to alter his ideas of the scope of the job, or his methods of doing it, when he arrives to make a start, or, worse still, when he has already begun it.

If the engineer is uncertain himself as to what is a desirable standard for any particular material or form of workmanship, there are available Standard Specifications and Codes of Practice published by the British Standards Institution which cover a great deal of the materials in reasonably common use today.

Generally speaking, care should be taken to avoid setting an unreasonably high standard of quality, particularly at the present time, for such demands, besides increasing the cost of the work, may possibly cause serious delays due to the increased difficulty in obtaining early deliveries of non-standard items. The use of these Standard Specifications is rapidly becoming more widespread and the general adoption would be a very progressive step, for it will tend to produce a satisfactory even quality throughout all works, and incidentally will simplify the work entailed by the engineer in producing the specification and some of the problems of the contractor in complying with it.

General Conditions of Contract

At this stage we have dealt with the documents which set out the practical requirements of a contract. It now remains for us to consider the legal, financial, and general conditions which should be applied.

Reference should be made to the general conditions of contract agreed between the Institution of Civil Engineers and the Federation of Civil Engineering Contractors, and also the similar document produced by the Institution of Gas Engineers with the Society of British Gas Industries. Both these documents have the common purpose of achieving a desirable standard of conditions to apply to any contract. The former document is set out in somewhat fuller detail, and has the advantage that it includes also standard form of tender, agreement, and bond.

The use of either is to be most strongly recommended as each will obviate the unsatisfactory state of affairs that has previously existed, and in fact can still be met with occasionally today where an authority makes use of a set of conditions consisting largely of cumulative additions made in the light of various experiences and legal decisions, covering page after page, making the contractor responsible for every possible contingency, and a few impossible ones also, the only real effect of which is to force the contractor to increase his prices to cover the unreasonable risks involved and his solicitors' fees in explaining them to him!

Seriously, though, these standard forms are adequate for any contract; the responsibilities of both parties are correctly and equitably defined; they have been drawn up by professional and practical men, directly connected and acquainted with the requirements of the work, and should automatically be embodied in any set of contract documents. Their use, again, simplifies the engineer's task and gives the contractor considerable reassurance in the knowledge that all his jobs are subject to identical conditions, wherever he may be working.

Having reached this stage we should turn our attention to the form in which the contract will be presented, consideration of which will have occupied the mind of the engineer to some extent, owing to the variety of forms which are open to him and the problems which arise with regard to their use.

There are two main types of contract, each of which has two or three variations to it. On the one hand, there is the fixed price type of contract, which can be in the shape of a bill of quantities, lump sum amount, or a schedule of items, and, on the other, there is the cost reimbursement form which is in each case based on the actual cost of the work, with the addition of a percentage, a fixed fee, or a sliding scale of fees.

The bill of quantities, the most usual type of contract, is made up of a detailed list of the quantities of work involved, against each of which the contractor quotes a unit price which when multiplied by the measurement of the work gives a series of sums, their total being the contract figure.

Lump Sum Contract

The lump sum contract is the form in which the contractor agrees to undertake the works described by drawings and specification for a fixed and stated lump sum. The schedule of items is perhaps hardly a fixed sum type of contract, from the contractor's point of view anyway, for it consists merely of a descriptive list of the various items of work involved, against which he has to place his unit prices.

In all the types of cost reimbursement contracts the contractor is paid the actual net costs incurred by him in carrying out the works, plus a fee to cover overheads and profit. In the first case this is an agreed percentage of the actual cost, in the fixed fee contract it is a previously agreed lump sum, and with the fluctuating fee type an amount, based on a sliding scale, dependent on economies achieved in comparison with a previously agreed estimated cost of the work.

Of these variations, the most generally used is the bill of quantities, which has the advantage that only the actual measured quantities of work done are paid for at the appropriate rates in the bill and the contractor is given a clear picture of the total work involved. Its disadvantages lie in the time needed for its preparation and the care which is required to compile it. This is, of course, particularly so if the work in hand is considerable and involves many trades and operations, in which case it may be considered beyond the scope of the staff of an undertaking, when suitable qualified professional advice should be enlisted.

For the average job, however, most engineers will be able to compile a bill which will ensure their receiving comparative and reasonably priced tenders for the work, and one of the various publications on the subject—the Recommendations of the Committee on Engineering Quantities, for example, published by the Institution of Civil Engineers—might be of great help.

In the construction of a bill it should be remembered that its objects are to provide the engineer with an accurate idea of his ultimate expenditure and the contractor with enough information to assess this figure and at the same time to form a basis for the valuation of the work when it is eventually carried out.

Every effort should be made to calculate the quantities accurately from the drawings and not include for a wide safety margin. The reasons for this are that the contractor's ordinary risks, overhead charges, insurances, maintenance costs, and profits are usually spread over all the item rates, and one can appreciate that a big downward variation in the quantities could entail serious loss to the contractor.

The costs of major temporary works, such as coffer dams, for example, which may be required before any permanent works can be undertaken, should be the subject of separate items, and it is a wise practice to insert a provisional sum item to cover the engineer for the cost of contingencies. From the contractor's point of view it is of great assistance if they are supplied with a duplicate copy of the bill of quantities; it is, in fact, an officially recommended practice.

The lump sum form of fixed price is generally only particularly suited to small jobs where all the work is either above ground or at least fully and completely visible, or, in other words, where unforeseen factors likely to vary the price or quantity will not arise. Otherwise it has the serious drawback that it becomes, in a sense, a quantity estimate as much as a price estimate, in which the contractor is being expected to duplicate his risks, with the result that the successful tender is only too often the one in which some item has been either under-measured or omitted completely.

Neither cost plus percentage, nor cost plus fixed fee, preserves quite the same financial incentive as the fixed price type of contracts, and in this respect probably the cost plus fluctuating fee type is preferable, as the fee either increases if economies, within stated limits, are achieved, or decreases if the costs exceed a given figure; even so, this type remains expensive to the undertaking owing to the extra costs entailed in checking the accounts.

Contractor's Procedure

In examining the procedure adopted by the contractor when submitting a tender for civil engineering works we must emphasise that, while in fact every firm will cover much the same ground, in detailed methods all may differ to some extent. Contractors are by nature a most independent race and on questions of this sort are likely to hold most dogmatic views and opinions varying considerably on any one point. So that we shall feel on safer ground if we say that on receiving an enquiry the following is, broadly speaking, the procedure that is followed.

In the first place the drawings and documents must be examined in order to obtain a picture of the nature and scope of the work, following which the site must be visited, while at the same time, provided the contractor has been supplied with a duplicate copy of the documents, enquiries can be sent out for the materials that will be required, a no mean operation in itself on a job of any size.

The visit to the site adds to the picture of the job, by the information one can obtain regarding such points as site conditions generally, access, working room, perhaps more details as to the ground, if excavations are involved, and the extent of local labour and material resources; all of which may have an effect on the way in which the job will have to be done, and generally speaking a 'feel' of the job is obtained, which, of course, cannot be conveyed by the documents above.

With this information the estimating staff are then in a position to consider what is the best method of tackling the work, having regard to the known resources available at the time. It may appear that, by the purchase of some additional piece of equipment, for example, the work could be undertaken more expeditiously, but the ultimate decision on a question such as this is, will this particular job pay for such a purchase? If not, it must be confirmed that enough future work is likely to come about over which the balance of the cost could be spread, or that the salvage value after the first job is completed would be sufficient to cover the outstanding cost. Otherwise special purchases will not necessarily achieve any economy.

With the method of working agreed and an outline of the sequence of operations decided on, the cost of the labour, plant, and material requirements can be estimated, and it then means that this cost has to be divided up over the relevant items in the bill of quantities. The contractor has then arrived at a series of net unit working costs.

These net costs have then to be increased by the inclusion of a number of more indirect costs before the tender rates are completed, these being charges which cannot be placed wholly against any specific item. One group of these will include the costs of general site transport, small temporary works, such as access roads, temporary buildings in the way of stores, cabins, and site offices, insurances, welfare, and the costs of any bonds or guarantees and the expenditure incurred in maintaining site offices and the salaries and wages of staff required for supervision and administration of the job; all of which together represent the site overhead expenditure that will be required for the one particular job.

The costs, to the contractor, in running his business as a whole can only be recovered by a charge to each contract he undertakes. His expenses at head office and depôts are calculated and expressed as a percentage of his actual wages turnover. The percentage addition is then included in his estimate of any job he is pricing and is again usually spread over all the items in the bill. This applies also to the remaining and most important oncost—namely, profit, to which is usually coupled the costs incurred in financing the work.

We have briefly covered the general procedure adopted, and we have endeavoured to illustrate the sequence of events leading up to the letting of a contract, and it is hoped that some points have been raised which possibly have not occurred to you.

In the preparation of the conditions of contract, the specification, and the bills of quantities, it is necessary to give the contractor as much information as possible. The fairer the conditions, the clearer the specification, and the simpler the bills of quantities, the more likelihood there is that the employing authority will obtain a tender at a fair and economical price; and with a fair price goes the other essential to efficiency, a happy job. The success of the job eventually depends on the relationship between the employers' engineer and the contractor's agent, and it should be the ambition to make the contract easy to understand so that the relationship between these two engineers shall be as free from friction as possible. The final essential for an efficient job depends, very largely, on the relations with labour.

Labour Relations

All wages and working rule conditions are governed by the Civil Engineering Construction Conciliation Board for Great Britain. This body, with the employers' representatives on one side has representatives of the Transport and General Workers Union and of the General and Municipal Workers. The essence of this board is that it is of a national character and all its decisions are made on a national basis. It can make immediate awards, which in industrial relations is of the utmost importance. While, to a large extent, its decisions on basic wages are governed by the National Joint Council for the Building Industry, its wages structure is very different. The building industry fixes a rate for craftsmen and from that deduces the labour rate. The civil engineering contracting industry fixes its labour rate and adds plus rates for its skilled employees.

Recently, owing to the differential between the craft and labour rates in the building industry becoming too great, there have been certain increases in the labour rates in the building industry. This has arisen through the fact that the labour rate is a percentage of the craft rate and, with succeeding increases in craft rates the differential has increased. This labour increase has been reflected in the civil engineering industry.

Generally, the industry, thanks to wise leadership on both sides, has been singularly free from disputes, and great credit is due to the very simple and straightforward composition of its conciliation board.

DISCUSSION

Opening the discussion, the **President,** Mr. S. C. Bentley (Oxford), remarked that there was not a shred of doubt that the gas industry owed a great debt to the many contractors who had served it, not only by doing work outside their normal scope of activity, but also by the great amount of expense and energy which had been put into research on

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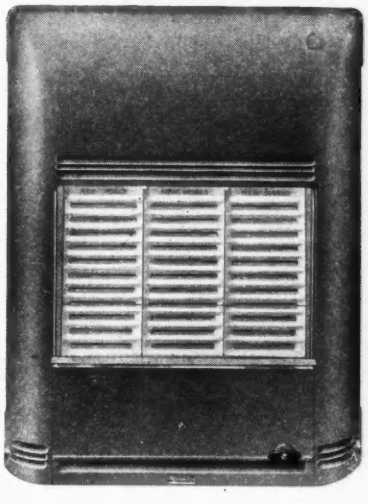

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plant, &c. There had been a time when contract forms had been devised to tie the contractors hand and foot and to impose penalties upon them if they did not fulfil their stated obligations; one wondered how, under those circumstances, contractors could get a job done, still less make a profit. Similarly, engineers were once told that contractors were complete sharks, and it was always necessary to keep one jump ahead of them. If the unfortunate contractor required any extras for extra costs, it was like getting blood out of a stone. Happily those days were past. The contractors had formed a union, and today conditions have led to better work and equalisation. The authors' paper had had the virtue of being non-technical, dealing fairly with the relationship existing between contractor and engineer.

Mr. **S. Brockbank** (Walsall), after referring to the curious fact that contractors were usually large men with large cars, both of which became larger with the years, said that for obvious reasons the type of contracting of most interest to them was gas main laying. Was there of necessity a saving effected by using a contractor? The point was open to doubt. If the men could be obtained to do the job, direct labour was cheaper. It was true that there was a tendency to discount overheads, but would overheads really be reduced by using contractors? His own undertaking's practice had been to put the larger jobs to contractors and keep a special gang for ordinary jobs. It was necessary to be sure that a contractor knew his job; some contractors put men on a job who were not trained to deal with gas. He wondered what percentage of the men employed by the authors' firm had a proper knowledge of resuscitation, and whether their breathing apparatus was regularly inspected. Also, what size of job was assisted by mechanisation? A last query: when a main was tested under air pressure, what was a reasonable pressure to employ, and should there be any allowance for a long length of main under pressure?

Replying, Mr. **Roach** agreed that the usual procedure was for an undertaking to have its basic gangs and to make use of a contractor when those gangs were full up with work. Obviously much depended on the undertaking's resources. With regard to the comparative costs of contracting versus direct labour, the North Thames Gas Board, for whom his firm had worked since 1913, would probably maintain that there was not much difference. Most undertakings did not realise the true cost of small tools and their losses, and such items were frequently omitted from their reckonings.

A Tricky Question

The question of mechanical plant and its true value was a tricky one. At best a multi-bucket trencher could do 4-5 ft. per min., but it would probably be idle for much of the day simply because it was not possible to keep up with it. On the other hand, small plant, with a slower and more comfortable speed, was of little use on a difficult job embracing unexpected changes of soil, &c. In general then it might be said that no saving could be effected by the use of mechanical plant with small mains (12 in. or under), but for large mains, such as those in the 24-36 in. class, a machine was a great help.

On the question of a satisfactory test for a low pressure main, 10 lb. per sq. in. should be satisfactory, but if lead joints were being used care must be taken because of the friction existing between the lead and the iron. Theoretically no allowance should be made for the length of main when testing, but in practice absolute perfection was seldom possible.

Mr. **H. Langley** (Whittaker Ellis, Ltd.) referred to Mr. Brockbank's mention of comparative costs. Overheads were undoubtedly the real bogey, and he had encountered certain engineers who looked askance at day work rates when they saw 33% added, apparently for profit. But much of that was taken up with overheads.

Mr. **F. H. Bate** (Wolverhampton) was concerned with the procedure of tendering. There was some doubt as to whether the bill of quantity became the property of the contractor. What happened if a tender was provisionally accepted and an error appeared later? Also, what was the authors' view of the fluctuating fee type of contract? How was the initial sum fixed for the job?

Replying, Mr. **Roach** asserted that the bill of quantity was certainly not the property of the contractor who, moreover, was under an obligation not to divulge the contents to another source. This bill of quantity should always be checked by the engineer before accepting the tender; if the bill was wrong and the contractor signed it, then the units of rates would stand. But he had never heard of a case where a contract was accepted and the rates were subsequently shown to be wrong. The fluctuating fee type of contract was only used where there was some doubt concerning the outcome of the job, *i.e.*, where it was impossible to envisage all eventualities. If a firm submitted a tender which was proved to be the lowest, it would be asked to put in a percentage fee. If the cost of the job showed a saving, the contractor was entitled to half of that saving. If, on the other hand, the cost showed an increase, the contractor was not entitled to any extra fee. However, the whole of the cost to the contractor was paid by the engineer or the authority.

In response to a query concerning the suitability of a contractor, Mr. Roach remarked that in many cases a small contractor could knock the large firms into a cocked hat as far as prices were concerned. The small firm's overheads were lower, having less office facilities and less mechanical plant to keep up. Many such firms were excellent and could do jobs very cheaply in comparison with their larger competitors. On the big job, however, they were quite lost.

In response to another question regarding the comparative costs of material and wages, the author explained that the former was small in comparison with the latter—less than 50% in fact. On occasion the contractor would charge 10% for storing the funny things required at short notice by a client; storekeeping costs on these occasions could be quite heavy.

Mr. **F. L. Atkin** (Birmingham) remarked that the contractor had something in common with the medical profession—the ability to bury his mistakes. On the other hand, unlike the medical profession, exhumation and resurrection were constantly going on and old mistakes sometimes saw the light of day again. At Birmingham, however, where contractors had been responsible for main laying, past work had been found to be of the highest order. He had seen mains laid at least 60 years before which exhibited solid bedding, correct level, and good joints. Did the authors think that the standard of main laying was as good now? The trench work itself was presumably unalterable, but it was the back filling and knocking up of joints which was of great importance. He wondered, too, whether the same hard work was put into the jobs today. Their mainlaying would be judged by posterity, and a down-grading of standards would not meet with the approval of their successors. Would Mr. Roach say honestly which he believed could maintain the highest standard of work—direct labour or contractors. He did not believe that contractors trained their men properly, the practice of upgrading labourers being too common.

Few and Simple Rules

The rules for good mainlaying were, he believed, very few and very simple. They were as follows: (i) The employment on the work at all times of a qualified ganger; (ii) proper supervision of the work by a representative of the engineer; (iii) the furnishing by the gas board to the contractor of proper drawings, giving all details of levels, &c. In the past too much had been left to the contractor, and such was the frailty of human nature, he had taken the line of least resistance.

The testing of both low and high pressure mains was a tricky business, but many would be aware that there was a Pipes Committee of the I.G.E. which was considering a Codes of Practice for high pressure mains. Their investigation was not yet completed, but many of their findings had been of great interest and importance. The figure of 10 lb. per sq. in. had been mentioned as satisfactory for testing low pressure mains. This was, in his opinion, too high. Cast iron was an elastic material, while lead was virtually plastic. The pipe would expand under pressure and the lead would follow suit; but subsequent contraction would leave the lead as before. It might possibly be argued that the sockets were also elastic and might push the lead back again.

Mr. **Roach,** in his reply, commented on the standard of labour today compared with that of 50 or 60 years ago. It was now difficult to get men into the industry because of its essentially casual nature. They had been trying hard to get the right type of man, and to this end they had started a number of training schools for jointers and had had an understanding with the Ministry of Labour. They had failed completely. One by one the schools had shut down, and there was now no choice but to train the men on the job. In addition, the men today had less nourishing food and with the vastly increased access to amusements, did not like hard work as of yore. The solution might be in mechanisation, and the flexible joint was the answer to that problem. Men could now rely on full

employment and would no longer travel when they could obtain employment near home. There was, they complained, nothing to do in the evenings and they were robbed by their landladies.

Mr. **W. J. Westbrook** (Oxford), in voicing his appreciation of the paper which, he said, presented an unaccustomed viewpoint, referred to the author's comments on competition. The undertaking required the best possible standard of mainlaying but at the lowest possible cost. It was, therefore, extremely interesting to hear Mr. Roach's remarks on how a contractor thought a gas undertaking might lay mains at lower cost. He wondered whether the contractors felt undertakings were setting too high a standard; for example, would the authors advocate shallower depths? It had already been stated that mechanical plant formed a considerable proportion of a contractor's overhead costs, but how often this mechanical plant arrived only to break down, necessitating fetching duplicate plant from miles away. The inevitable excuse was that 'It was all right when it left the last job.' For this reason one of the essentials with mechanical plant was a full complement of mechanics.

With regard to testing joints, it was a little difficult to understand Mr. Roach's dislike of the repeated pumping up of main; after all, it had to work under these conditions. In any case, run lead joints were now obsolete, expanded joints having taken their place.

In reply Mr. **Roach** pointed out that the best was not always the cheapest; high quality work and low prices were seldom synonymous. It certainly was not possible to interfere with the depth of main laying, but undertakings did not take enough advantage of the law and use wayleaves. On cross country runs one still saw men fiddling round hairpin bends. With reference to Mr. Westbrook's comments on the failings of mechanical plant, this was a constant headache to the contractor. Plant had to be transferred from job to job, and although the most elaborate precautions had been devised, such as record cards, &c., to enable information of mechanical faults to be passed on, the problem remained unsolved. They had once calculated how long it would take them to find out that a compressor had been stolen, and it turned out to be a matter of weeks. As a firm, William Press, Ltd., was making the maximum effort to decentralise, having their own local repair shops; this was certainly a partial solution.

Mr. **Milner,** giving, as he put it, the point of view of the small works man, remarked that his undertaking had recently laid four miles of 10 in. main, a job which embraced several road crossings. To assist them they had made use of a small ditching machine, but had had the utmost difficulty in keeping up with it. In fact, the frequent breakdown of that machine had been their salvation.

Mr. **W. A. Pask** (Leicester) said that, in his experience, a constantly recurring sore point was the question of 'extras,' which constituted a source of much trouble and dissatisfaction. This problem would be removed if the contractor could employ on site an engineer in whom he placed full confidence and trust so that this question could be resolved as it arose. There would then be no need to try and sort out an account from the contractors elusive headquarters which, although unjustifiable, could not be checked owing to the fact that it referred to something which happened many months before.

The question of the possible degradation in the quality of mainlaying had been discussed, and he would like to state that in his own view no such degradation had taken place. On the contrary, in many cases an improvement had been effected, and for this mechanical joints were largely responsible. Years ago when men were paid an hourly rate, speed was not of prime importance. Today labour costs had risen to such an extent that a different position had evolved. There was a tendency to beat this problem, not by paying men on an hourly rate, but by the introduction of bonus schemes and piece rates. He would be interested to have the authors' views on the effect of these schemes on the quality of mainlaying. It should never be forgotten that costs must not be subjugated to quality.

Mr. **Roach** said he was a little surprised at the speaker's reference to 'extras.' However, the solution surely lay in the provision of more information for the contractor to work on, resulting in a happier job and therefore, fewer extras. A daily summary of work was submitted to the engineer, but it was not possible to have an agent on the job all the time. There should be no delay in settlement of these extras.

With regard to the advantages and disadvantages of various schemes, there was really a choice of three methods: Piece work, bonus on output, and straight time work. The most satisfactory depended primarily on the foreman. With sufficient supervision no harm could result from the bonus on output scheme, which must incidentally be linked to a minimum day's pay. This method produced the best results but it certainly required much closer supervision.

A vote of thanks to Mr. Roach and Mr. Stevens was proposed by Mr. **J. Palser** (Birmingham), Vice-President of the Association, and seconded by Mr. **R. B. Watkins,** Junior Vice-President.

GAS IN FRANCE — Continued from p. 521.

mill. m³ (31,800 mill. cu.ft.) of gas or about one-third of the present sales of the gas industry. The gas industry has, therefore, but a short time in which to increase its production and to fight against the competition of other forms of energy.

The struggle will be the more severe as the gas calorie will not remain with certainty the cheapest calorie in the fuel market and the industry must hope that at last the authorities will take the necessary steps to realise the financial balance of the industry by a rational revision of tariffs.

The future of the industry is to be viewed with confidence and with optimism. This industry contributes to the prosperity of the country; it offers a choice of markets to important volumes of gas available for sale by the coke oven plants of the collieries and the steelworks; it contributes, finally, to the amelioration of the hygiene, the comfort, and the general elevation of the standard of life of the population of France.

The new laboratory of Industrial Physics at Gennevilliers is described in detail. This is one of the three laboratories situated in the rue d'Aubervillers, the rue Amelot, and at Gennevilliers, referred to in the article, an abstract of which we published in the *Journal* of February 8.

Quality Control

In a paper presented in October last to a meeting of distribution engineers, M. A. Amsler discussed the control of the quality of gas in small and medium gasworks. For works of 70 mill. cu.ft. annual capacity and upwards, the use of a calorimeter is recommended preferably with recorder. For smaller works one or other of the flame type indicators is suggested. For the control of the combustion characteristics, a test burner has been perfected by M. Delbourg working under M. Biard, Chief of Research, and is to be described shortly. It is said to provide a practical and rapid means of defining the aptitude of a gas to function satisfactorily in all types of appliances within the limits of the means of regulation with which these appliances are normally provided. M. Amsler goes on to deal with control of purification, odour, carbon monoxide content (the pre-war regulation fixing a maximum of 15% appears to have been abandoned), pressure in the district, and some other details. But the chief interest of the paper is the organisation of regional control which it suggests, a question which is said to be under discussion by the various directors of Gaz de France. Some schemes are already in operation.

M. Amsler's suggestions—of principle only—are that the principal works of each group should have a well-equipped laboratory with apparatus for the complete analysis of gas. The personnel would be composed at least of one qualified chemist (chef de laboratoire) and one experienced assistant. The personnel should visit the works of the sub-divisions at least once a week and go over the controls with them. They would also standardise and verify calorimeters and other apparatus throughout the group. This activity should in no way diminish the authority of the sub-divisional manager, and these controls should be looked upon as assistance rendered by the better-equipped central works. It is also suggested that automobile laboratories should be provided capable of travelling round the smaller works to check the necessary controls.

A national survey of the transport resources of private road hauliers is being undertaken by the Road Haulage Association. As far as can be estimated, the nationalised road haulage fleet will not exceed 40,000 vehicles, and the number left under free enterprise is some 120,000, this latter figure excluding the 700,000 vehicles operated by traders under 'C' licences for the carriage of their own goods. The survey will give information, among other matters, on hauliers carrying bulk liquids and indivisible loads, which are excluded from the mileage restrictions of the Transport Act; and on operators restricted by the Transport Act to a radius of 25 miles from their base.

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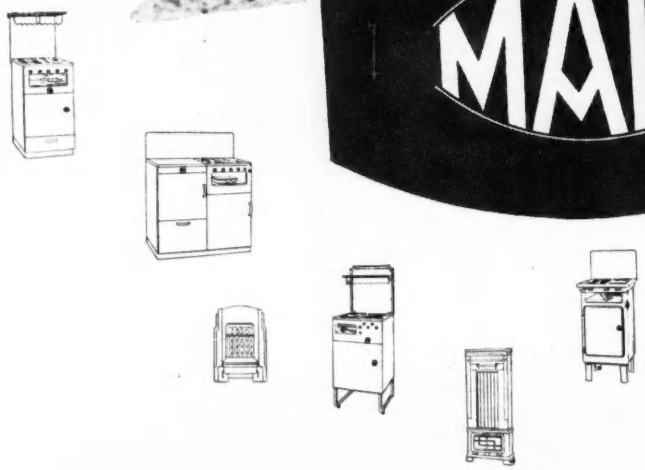

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